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Market Studies of United States

Steel Castings Market in Illinois, Indiana, Michigan, Ohio, Pennsylvania, and Wisconsin

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THE STUDY OF THE STEEL CASTINGS MARKET IN ILLINOIS, INDIANA, MICHIGAN, OHIO, PENNSYLVANIA, AND WISCONSIN FOR POTENTIAL OF ENTRY BY CANADIAN STEEL FOUNDRIES

FOR

GOVERNMENT OF CANADA

DEPARTMENT OF EXTERNAL AFFAIRS

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PROJECT SCOPE AND OBJECTIVES

This study report has been prepared for the Government of Canada, Department of External Affairs, Ottawa, Canada, and addresses the Steel Castings Market in the five-state East North Central Region of the United States plus the state of Pennsylvania. The market for railroad castings has been excluded from this report. The railroad market is in an extremely depressed condition and it is forecast that the future demand is to be satisfied by highly cost effective U.S. producers. A supply surplus of 20% to 30% is forecast for 1985. The defense market is not included as a separate market segment. However, the major defense market for steel castings, military vehicles, is included in the "Truck" classification. Separate statistics have been included for tank castings.

During the course of the project, the following scope of objectives is considered to have been satisfied:

- Identify and quantify the steel castings market in the six-state region of Illinois, Indiana, Michigan, Ohio, Pennsylvania, and Wisconsin.

- Identify and quantify the major consumers of steel castings in these major market segments:

  - Construction Machinery and Equipment
  - Mining Machinery and Equipment
  - Mill Machinery
  - Trucks, Buses, and Trailers
  - Valves and Fittings
  - Pumps
  - Other Machinery

- Determine demand as related to the following alloy classifications:

  - Carbon and low alloy steel
  - Heat resistant steel
  - Corrosion resistant steel
  - Manganese steel

- Determine demand by casting size ranges as follows:

  - Under 100 pounds
  - 101 to 500 pounds
  - 501 to 1,000 pounds
  - 1,001 to 5,000 pounds
  - 5,001 to 10,000 pounds
  - Over 10,000 pounds

- Determine current competitive casting selling prices by alloy, casting size, and end use market, where possible.

- Establish projections of market growth or decline through 1985.

- Determine casting purchasing criteria used by consumers as related to casting cost, product quality, or unusual conditions.

- Identify current and projected sources of supply quantitatively from captive U.S. foundries, U.S. commercial foundries, and offshore import sources (import sources in this report are considered to be all those supplied from outside the continental United States or its possessions).

- Select and interview consumers of steel castings for the major market segments in the six-state region.

- Identify U.S. markets considered to have potential for the Canadian steel casting producers.

- Identify market entry barriers and preferred sales methods and channels to be used to increase penetration or initially penetrate these markets.

APPROACH TO THE PROJECT

Information from Knight's proprietary data sources and recent marketing projects related to the United States production and consumption of static cast steel castings was reviewed, analyzed, and accumulated as related to the states of Illinois, Indiana, Michigan, Ohio, Pennsylvania, and Wisconsin. These data were then updated to reflect the present economic condition of each market as to current production, consumption, pricing, and import volume effect.

Consumers of steel castings in each of the major market segments located in the subject six-state area were selected for telephone interview. The purpose of these interviews was to establish current purchase volumes; industry changes or trends projected to affect the use of steel castings; preference toward direct supplier contact or use of agents when purchasing steel castings; purchasing policies as to the relative importance of price, quality, and delivery; and policies regarding use of imported supply and prevailing purchase prices of steel castings.

Some major consumers of steel castings, of course, are not located in the subject six-state area. The demand of these major manufacturers situated in states adjacent or close to the subject six-state region has been included in regional tonnage figures and is identified in the exhibits of this report. Two large Kentucky valve producers are included, one in Indiana statistics and one in Ohio statistics. The Pennsylvania demand tonnages include one New York valve producer, one New Jersey valve producer, and one New York pump manufacturer.

The information contained in this report regarding current demand, projected consumption, product pricing, and the impact of imported steel castings is related to each individual market segment and not to the industry as a whole. It has been developed using interview data, Knight's experience in the industry, and information from Knight proprietary sources. The projections are based on our knowledge of industry trends and communication with producers and consumers of steel castings and may not agree with data published by the U.S. Department of Commerce, the Bureau of Industrial Economics, or the various industry trade associations.

All monetary references in this report are expressed in current United States dollars.

THE STEEL CASTINGS INDUSTRY IN THE UNITED STATES

As a preface, it is considered that a brief review of the industry's recent past and general current situation be presented.

The requirements and production of steel castings in the United States between 1972 and 1980 have been generally balanced and, excluding recession years, have been in the 1.8 to 2.0 million tons per year range. Domestic production capacity at the end of this period was considered to be 2.2 and 2.5 million tons per year and was only minimally affected by foreign imports. The economic recession in 1977 caused a reduction of 125,000 tons.

Since 1980, the steel castings market has continued to decrease to a low of approximately 1.0 million tons of shipments in 1982 with projected shipments in 1983 forecast to be approximately 1.14 million tons. This drastic reduction in tonnage is due to the following factors:

- Depressed conditions of the freight car market
- Increase in imports
- The general recessed economy
- Loss of applications to ductile iron

Along with the ever-decreasing casting demand, the excess available foundry capacity, and the continued foreign import pressures, competition among producers for the remaining markets has become intense.

The largest consumer of steel castings in the United States is the railroad industry and represents approximately 40% of the total market. The railroad industry is generally faulted as the main cause in the steel castings market decline. Close study, however, does not confirm this conclusion. Except for 1979 when a record 90,000 new railroad freight cars were built, and the railroad industry consumed 53% of all steel castings, their average consumption as a percentage of total consumption has fluctuated less than 10%. The unusually depressed condition in the freight car market (6,000 cars in 1983) has not reduced the railroad percentage of the total market appreciably. The 1983 level of approximately 39% is expected to return to the normal 40% range as economic conditions improve. This would indicate that average U.S. economic conditions control the fluctuations of the market demand.

Although attrition due to various causes continues to erode the domestic supply side of the industry, especially for the marginally competitive jobbing and railroad equipment castings, domestic supply is projected to exceed demand at least through 1985. Exceptions in specific markets and castings sizes are to be addressed later in this report. The supply capacity remained relatively constant at nearly 2.0 million tons for many years, though railroad castings capacity was increased in the late 1970s. Foundry closings in the last six months have lowered railroad casting capacity by 500,000 tons, while other steel casting capacity has only been reduced 100,000 tons.

Another condition affecting the domestic steel castings industry in the U.S. is the ever-increasing supply of imported castings. Intense foreign price competition is expected to continue to increase in the near term and is to continue pressure to expand the import share of the steel castings markets.

MAJOR MARKET PROFILES AS RELATED TO THE STEEL CASTINGS INDUSTRY IN THE UNITED STATES

Each major industry market consuming steel castings is affected by different stimuli and trends. These markets have been analyzed and general profiles for each are as follows:

Construction Machinery and Equipment (2nd Largest Steel Castings Market)
and
Mining Machinery and Equipment (4th Largest Steel Castings Market)

It is difficult to separate the Construction Equipment and Mining Equipment markets in reference to the consumption of steel castings. Realistically, ore crushing and dressing equipment and underground mining machinery for drilling, loading, and hauling are singularly used for mining, while earth movers, off-the-road haulers, power shovels, and tractors are peculiar to both industries.

These two industries combined account for approximately 25% of all alloy and carbon steel casting consumption in the United States.

Recent economic conditions considered, these two markets are expected to require approximately 275,000 tons in 1983 with projected compound annual growth rates of 11% and 12%, respectively for Construction and Mining Equipment.

The health of the Construction Equipment industry is heavily leveraged by new residential construction and road building and repair, both of which are currently showing upward trend increases over those previously forecast.

Steel casting usage is continuing to be eroded in the Construction Equipment market by ductile iron conversions in some of the lighter duty drive and axle housings.

Typical castings used in these markets are:

Parts	Weight Range (Pounds)
Tread Shoes and Track Pads for Crawler Equipment	30 to 700
Idler Rollers	40 to 100
Sprockets	100 to 500
Drive and Axle Housings	200 to 1,500
Track Links and Guides	15 to 50
Gear Boxes	75 to 400
Wheel Hubs	50 to 250
Miscellaneous Hangers and Brackets	10 to 75
Liner Plates and Mill Parts for Ore Processing	100 to 300
Power Shovel Bucket Teeth	2 to 60
Bucket Bales and Bodies	1,600 to 15,000

The domestic demand/supply conditions favor an excess in supply in 1985 as aggressive, competitive railroad foundries and imports continue to penetrate these markets.

Although 90% of the steel castings consumed by the Mining Equipment market are carbon and low alloy grades, approximately 10,000 tons of various grades of manganese steel are projected for 1983, less than 10% of which are used on O.E.M. units. The balance of wear resistant steel castings is produced by a group of select foundries specializing in the production of blades, power shovel buckets, bucket teeth, and liners and wear plates used in crushing and ore processing. These castings are generally founded on order from parts supply houses or directly from firms engaged in mining or construction as replacement items on operating equipment.

In addition to the wear resistant parts, approximately 2,000 tons of heat resistant castings are forecast for use in the mining industry in 1983. These castings are predominately for primary ore processing equipment with typical parts being hearth chain links, pins, and flights used in heating and sintering operations.

Trucks, Buses, and Trailers (3rd Largest Steel Castings Market)

The demand for carbon and low alloy castings in these markets is expected to be approximately 116,000 tons in 1983 and to exercise a compound annual growth of 4% through 1985.

The trends toward reducing the average weight per vehicle have reflected some minimal casting weight reductions, however, the weight of steel castings per vehicle is projected to decrease by approximately 10% between 1983 and 1985 as the result of conversions from steel to ductile iron castings in drive train housings and wheel spiders.

Steel casting use in these markets is unique in that, except for three major Truck, Bus, and Trailer manufacturers, the component O.E.M. parts are not captively manufactured, but are purchased as finished assemblies from independent manufacturers such as Dana/Spicer, Rockwell International, and Dayton Walther.

Typical steel castings used in these markets are:

Parts	Weight Range (Pounds)
Small Spring Hangers and Suspension Parts	5 to 20
Fifth Wheels	150 to 300
Banjo Housings	300 to 600
Large Suspension Parts	70 to 100
Wheel Spiders	50 to 70

Total domestic supply is expected to exceed demand for these parts by 5% to 10% through 1985.

Valves and Fittings - (5th Largest Steel Castings Market)

The Valves and Fittings market as related to the steel casting industry in the United States is highly fragmented. The largest producer is reported to control less than 3% of the total market with the top 20 manufacturers supplying approximately 30%.

The Valve Manufacturers Association, the major industry trade association, projects the following domestic user industries for 1983 to be as follows:

Industry	Percentage of Total Consumption of Valves
Chemical Production	15.3%
Petroleum Production	13.9%
Power Generation	13.3%
Petroleum Refining	12.4%
Water and Sewage	9.8%
Oil and Gas Transmission	8.3%
Pulp and Paper Production	5.8%
Commerical Construction	5.8%
All Other	15.4%

The Valves and Fittings segment of the steel castings industry is highly competitive and is the segment most heavily penetrated by foreign imports. A Steel Foundry Society of America study conducted in February 1983 indicated that approximately 27% of the United States steel valve requirements are imported, although other estimates vary from 11% to 40%.

The primary source of these imports is reported by the U.S. Department of Commerce as follows:

Country	Percentage of Total Valve Imports
Japan	29%
Canada	11%
United Kingdom	11%
France	8%
Italy	8%
West Germany	8%

The compound annual growth rate for steel valve and valve part castings from 1983 through 1985 is forecast to be approximately 16% with the projected requirements in 1983 to be 70,000 tons of carbon and low alloy.

Corrosion resistant valve requirements for the same period are expected to increase at a compound annual rate of approximately 33% with the 1983 requirements projected to be 17,000 tons.

Of the eight basic types of valves manufactured, the use of ball types shows the greatest increase, from 22% to 33% in the last 10 years, and butterfly valves increasing their share by 2.5% over the same period.

Although the general regional consumption data shown in this report include only the valves produced by the sand and shell mold processes, the industry is showing a heavy trend toward the use of investment castings in the smaller sizes of corrosion resistant, carbon, and low alloy valves and valve components.

The size range of steel castings supplied to the valve market varies from fractions of one pound to tens of thousands of pounds. The majority of the tonnage and pieces falls within the range of the 2 inch valve covers and bonnets between 2 and 4 pounds up to 24 inch balls, discs, and bodies between 400 and 1,000 pounds. Recent Knight studies show approximately 50% of the total pieces produced weigh less than 50 pounds.

It is forecast that domestic supply is to exceed demand by 15% to 20% in 1985 for medium and high volume castings up to 1,000 pounds. Larger valves for low volume orders show a potential 5% short supply by 1985.

Mill Machinery (6th Largest Steel Castings Market)

The demand for new roll Mill Machinery is continuing to decline with raw steel production and growth of the continuous casting processes. The greatest loss is in large steel back-up rolls. It is forecast that the use of continuous cast steel is to increase to 40% by 1989 and decrease the use of steel rolls to a ratio of .31 (roll shipments/raw steel shipments). Steel castings consumption in this market presently is dominated by repair and spare parts replacement of Mill Machinery castings and mill rolls.

Maintenance repair parts typically are one piece or very low volume orders and are currently being produced by the mill captive foundries or low volume commercial jobbing foundries with long-term customer/supplier relationships.

This market has been difficult to penetrate in the past except when major rebuilding programs were involved and unusually high volumes necessitated expanded sourcing. Despite the closing of three roll foundries - Bethlehem, Wear-United (Vandergrift), and Mesta - this supply is forecast to exceed the demand by nearly 20%.

Oil Field Equipment (7th Largest Steel Castings Market)

The recent decline in exploratory and production drilling in the U.S. has greatly affected the consumption of steel castings used in this industry. The oil production market responds to the Mideast political situation, spot market prices, domestic supply/demand, conservation programs, and utilities emission policies, among others.

Even though it is estimated that less than 10% of the Oil Field machinery is manufactured in the subject six states addressed in this report, it has been reviewed because of its total share of the steel castings market.

The total steel castings market, as stated earlier, is little affected by the geographic relationship between producer and consumer. The Oil Field Equipment market, however, seems to be the exception. Casting producers for this market are generally located close to the consuming regions of the South, Southwest, and West.

The forecast consumption of 34,000 tons of carbon and low alloy steel castings in 1983 may be optimistic, but does relate to the current economic conditions. Considering the excessive number of variables affecting this industry, growth projections through 1985 are forecast to be from flat to 5%.

Typical steel castings are as follows:

	Parts	Weight Range (Pounds)
Drilling -	Pin Supports	180 to 210
	Sheave Guards and Plates	40 to 50
	Block Hook Adapters	320 to 380
	Swivel Housings	220 to 360
	Swivel Goosenecks	50 to 75
Tables -	Turntables	500 to 1,000
	Bases	2,000 to 5,000
	Housings	50 to 200
Drives -	Sprockets	80 to 100
	Bearing Housings	100 to 200

Engines and Turbines (8th Largest Steel Castings Market)

This field is forecast as flat to declining through 1985 and is affected by new utility installations or modification and upgrading of existing facilities. In the manufacture of large engines for power generation, the castings are primarily iron. Steel castings are used for turbine housings, impellers, and various generator parts such as bases and housings.

Carbon steel castings for this market are continuing to be affected by foreign competition and, in conjunction with the declining industry outlook and declining utility purchases, has resulted in the closing of a major manufacturer's captive foundry.

The demand/supply situation in this classification is affected greatly by imports. If the U.S. dollar devaluates 10% to 15% against the yen and other currencies, imports should decrease and supply shortages could occur.

Special Industry Machinery (9th Largest Steel Castings Market)

The total consumption of steel castings in this market is significant at a projected level of approximately 19,000 tons in 1983. This volume includes corrosion resistant, heat resistant, manganese, and carbon and low alloy castings.

Unlike other major markets where major equipment manufacturers are easily identified, this market is highly fragmented and includes the manufacture of equipment for the food processing, packaging, textile, paper, chemical, tobacco, glass bottle, rubber, foundry, ammunition, and plastics industries. Significant consumers of steel castings for these markets have not been identified in the six-state region considered in this report. Many of the manufacturers of this equipment, however, are known to have relocated from the New England, Atlantic Coast, and Midwest regions to the South Central and Southeastern states.

Corrosion resistant steels are mainly used in the food products industry. Stainless alloys CF8 and CF8M make up 70% of the market. Heat resistant steels are used in reformer and ethylene, centrifugally cast tubes, and return banks for refining equipment. These alloys are normally HH, HK, HT, and nickel-chromium steel alloy.

Pumps (10th Largest Steel Castings Market)

The trends in growth and consumption in this market have in the past and are projected to continue to closely parallel those of the Valves market.

At the projected rate of growth, a potential 8% short supply of carbon steel pump castings over 5,000 pounds could exist in 1985. Demand would also exceed supply by approximately 10% for stainless and other corrosion resistant pump parts over 1,000 pounds during the same period.

The growth of this market section is very dependent on the Oil Field Equipment industry. If oil prices increase, our demand increases for pumping equipment. The pumps market should grow at a rate of 4% per year. The largest growth segment is in stainless steel pump casings. It is especially advantageous to have capabilities to produce stainless alloys, as well as high nickel base alloys as common pattern equipment is generally used to produce the same casting in several alloys.

Industrial Furnaces and Ovens

Overall, this industry consumes less than 1% of the total steel castings produced, but uses over 30% of all of the heat resistant castings. Growth in this market is expected to be minimal to flat at a compound annual rate of 1% to 2%.

These castings predominately fall in the 1 pound to 200 pounds weight classes and consist of small furnace parts, reformer and ethylene tube bends, and Ys and heat treatment baskets and trays. Reference in this report is to static cast parts and does not include centrifugally cast reformer and ethylene tubes projected at a level of approximately 9,000 tons in 1985.

Production of these industrial castings is presently supplied by specialty foundries producing heat resistant products.

STEEL CASTING CONSUMER INTERVIEW SURVEY

Contact was made with steel castings consumers in the following user markets:

- Construction Machinery and Equipment
- Truck, Bus, and Trailer Equipment
- Mining Machinery and Equipment
- Valves and Fittings
- Mill Machinery
- Pumps
- Machine Tools
- Industrial Trucks
- Furnaces and Ovens
- Motors and Generators
- Special Industry Machinery
- Tanks (Military)

Although the large majority of the interview candidates is considered to be heavy tonnage users of steel castings in the manufacture of their end products, effort was also extended to gather data on the lesser volume users in an attempt to provide a greater cross-section of the consumers.

Detailed information obtained from the contact survey is shown in Exhibit A and includes:

- Market identification
- User company name
- User company address
- User company phone
- Contact name and position, when available
- Projected 1983 demand in tons by alloy
- Tonnage distribution by casting weight
- Purchasing criteria
- Foreign or import supply policies
- Location of user plants for those firms with multiple facilities

The following is a summary of the survey results:

	Number	Percentage of Respondents
Total number of firms contacted	64	100 %
Number responding to some or all of the questions	57	89
Number responding, but requesting that the source of information remain confidential	20	35
Respondents stating price as primary purchasing criteria	21	37
Respondents stating quality as primary purchasing criteria	30	53
Respondents stating price and quality given equal consideration	6	11
Respondents with strict anti-import policies	0	0
Respondents reporting some current import supply	10	18

Projected 1983 tonnage (all alloys) represented by respondents is 155,000.

Information relative to the prices being paid by the respondents for commercial steel castings was most difficult to obtain. Some stated that this type of information was confidential, while others provided these data by alloy group. Some, however, catagorized their purchases by alloy and casting weight and are shown in Exhibit A.

A discussion of the responses is discussed in a subsequent section of this report.

PROJECTED DEMAND FOR STEEL CASTINGS IN THE UNITED STATES

The 1983 steel casting demand information from Knight sources and the respondent interview contacts was analyzed by major market segment and alloy for the individual states of the six-state region addressed in this study.

Carbon and Low Alloy Steel Castings

The 1983 consumption of carbon and low alloy steel castings in the United States is expected to be approximately 1,055,000 tons and is projected to be approximately 1,254,000 tons in 1985, equivalent to a compound annual growth rate of 9%.

Exhibit B shows a detailed analysis of the aforementioned carbon and low alloys steel casting demand and is summarized as follows:

State or Area	1983 Tons	1985 Tons
Illinois	82,110	100,041
Indiana	32,630	39,010
Michigan	64,327	70,886
Ohio	117,136	138,835
Pennsylvania	62,442	75,130
Wisconsin	51,065	62,153
Other or Unidentified	645,290	768,045

Other or Unidentified is the classification for all steel castings produced outside of the six states listed, all railroad castings, and castings produced for unidentified markets.

These six states are considered to represent approximately 66% of the non-railroad steel casting consumption.

As stated earlier in this report, the railroad industry is the largest tonnage consumer of carbon and low alloy steel castings followed in order of magnitude by:

Construction Equipment

Trucks, Buses, and Trailers

Mining Equipment

Valves and Fittings

Mill Machinery

Oil Field Equipment

Engines and Turbines

Pumps

Corrosion Resistant Steel Castings

Analysis of the corrosion resistant steel casting market is shown in Exhibit C. The total consumption of corrosion resistant castings in 1983 is expected to be approximately 39,000 equivalent to 3.4% of total steel castings demand.

The 1985 demand level is projected to be approximately 56,600 tons reflecting a compound annual growth rate of 20%.

The Valves and Fittings and Pumps markets account for approximately 60% of the corrosion resistant castings. Growth in the Valves and Fittings market is projected for 33% per year between 1983 and 1985.

Regional demand for corrosion resistant castings is as follows (see Exhibit C):

State or Area	1983 Tons	1985 Tons
Illinois	1,060	1,630
Indiana	1,100	1,640
Michigan	280	470
Ohio	8,320	12,800
Pennsylvania	5,475	8,300
Wisconsin	615	960
Other or Unidentified	22,150	30,850

Heat Resistant Steel Castings

Exhibit D identifies the distribution of heat resistant steel castings by market segment and state. The projected tonnage shown in this exhibit reflects only the static cast parts and does not include approximately 9,000 tons per year of centrifugally cast reformer and ethylene tubes used in Industrial Furnaces and Ovens.

Static cast demand of heat resistant casting for 1983 is projected at 20,500 tons and is forecast for a growth rate of 5% per year through 1985.

The Industrial Furnaces and Ovens industry represents approximately 34% of the heat resistant castings market followed by Special Industry Machinery and Mining Equipment.

A summary of Exhibit D is as follows:

State or Area	1983 Tons	1985 Tons
Illinois	1,805	2,025
Indiana	905	955
Michigan	1,005	1,130
Ohio	3,380	3,715
Pennsylvania	2,850	3,150
Wisconsin	925	1,065
Other or Unidentified	9,630	10,560

Manganese and High Wear Resistant Steel Castings

The variable terms of reference and definitions of manganese steel castings make it difficult to positively separate the varieties containing over 10% manganese from some of the wear resistant steels containing from 3% to 7% manganese but with total alloy content exceeding 10%.

Exhibit E shows the distribution of manganese steel casting demand and includes the high wear resistant grades containing less than 10% manganese.

Tonnage consumption for these grades of steel castings is expected to be approximately 28,000 tons in 1983 and is projected to increase at the rate of 10.5% per year through 1985.

The largest consumer industries for these castings are the Railroad and Mining Equipment segments, each at a current rate of 10,000 tons per year. The railroad products are predominantly track specialties such as frogs, crossovers, and switch components of the high manganese, Hatfield grades; the mining usage is generally of the high wear resistant type with under 10% manganese. The lower content grades are also used in the Construction Equipment fields, the third largest consumer.

Approximately 90% of the manganese containing wear resistant steels used in the Mining Equipment market are spare parts such as scraper blades, power shovel bucket parts and teeth, and liners and plates for crushing and other ore processing. Only 10% of the castings are reported to be used in the manufacture of new equipment.

A summary of the demand by state for these products is as follows:

State or Area	1983 Tons	1985 Tons
Illinois	670	860
Indiana	210	250
Michigan	-	-
Ohio	1,110	1,340
Pennsylvania	650	810
Wisconsin	1,780	2,200
Other or Unidentified	23,580	28,640

DEMAND DISTRIBUTION BY CASTING WEIGHT

The demand distribution of the various alloy groups of steel castings by casting weight was addressed in the interview survey, the results of which are shown in Exhibit A. It is felt, however, that when considering the disciplines of the interview candidates and that these types of data are not normally immediately available, the responses were considered to be estimated.

Using data developed in recent studies for consumers and supplier foundries in the major steel castings markets, in conjunction with the resulting survey response, a detailed analysis of the demand tonnages by major market, casting size range, state, and alloy has been prepared and projected for 1985.

Exhibit F is addressed to carbon and low alloy castings, Exhibit G to corrosion resistant castings, Exhibit H to heat resistant castings, and Exhibit J to manganese and wear resistant castings.

Exhibit F, page 1 of 6, describes the market for carbon and low alloy steel castings in the State of Illinois, forecasted to reach 100,000 tons by 1985. The main market for steel castings in Illinois is with the Construction Equipment manufacturers, which includes the three largest in the U.S., namely, Caterpillar, Deere & Co., and International Harvester. The majority of the castings for O.E.M. producers such as these are medium to high production quantities of steel castings in under 100, 101 to 500, and 501 to 1,000 pound weight ranges for use in off-the-road vehicles. Steel castings are used in these applications because of their toughness and low temperature impact resistance.

It is forecasted that Caterpillar is to purchase nearly 50,000 tons of steel castings in 1983. These purchases could increase by 50% by 1986 to return to levels of purchases in the late 1970s. Deere & Co. is forecast to purchase nearly 3,500 tons in 1983 and Fiat-Allis 2,000 tons.

Other markets for carbon steel castings in Illinois are relatively small and divided among the other industrial markets as shown.

Markets for carbon and low alloy steel in the State of Indiana, Exhibit F, page 2 of 6, are forecast to consume approximately 40,000 tons in 1985. No one market is expected to dominate the picture, though the steel industry in the northern part of the state is expected to consume nearly 4,300 tons in 1985. The two largest markets are Construction and Mining Equipment.

The usage of non-railroad carbon and low alloy steel in the State of Michigan (Exhibit F, page 3 of 6) is dominated by the Truck market, which is forecast to consume nearly 50,000 tons of castings per year in 1985. As is explained on page 7 of this report, the steel casting use is unique in this market. Except for three major manufacturers, the component O.E.M. parts are not captively manufactured, but are purchased as finished assemblies from independent manufacturers such as Rockwell, Dana/Spicer, and Dayton Walther. Construction Equipment is the second largest consumer of castings with a forecasted annual tonnage of 11,900 tons in 1985.

Manufacturers in the State of Ohio are the largest consumers of non-railroad steel castings, as is shown in Exhibit F, page 4 of 6.

It is forecast that 35,800 tons of castings used in Mining Equipment are consumed in Ohio by such manufacturers as Euclid-Daimler, Terex, National Mines, Marion Power Shovel, American Alloy, Owens Bucket, and others. Many of the applications of steel castings could be considered "Construction Equipment" parts, however, most are classified under Mining Equipment.

Approximately 30,000 tons are forecast for carbon and low alloy steel castings for Trucks, Buses, and Trailers. White Motor, International Harvester, Rockwell, and Dayton Walther are large consumers of steel castings.

Construction Machinery and Equipment is the third ranking consuming industry in Ohio. Galion, Jeffery, Terex, and Euclid are large purchasers of castings.

Carbon and low alloy cast steel valves are forecast to reach 24,700 tons in 1985 in the State of Ohio. Such large valve producers as Xomax (Tufline), Powell, Conval & Duriron are consumers of steel castings.

Mill Machinery Equipment is also a large consumer of carbon steel castings in Ohio. Such manufacturers as Republic, Armco, Copperweld, U.S. Steel, Bliss, Production Experts, Pollock, and others are to purchase a forecasted 14,000 tons in 1985. Most of the mill castings are over 1,000 pounds in weight.

Mining and Construction Machinery and Equipment is also the largest consumer of steel castings in Pennsylvania with a forecast of 33,000 tons in 1985. However, Valves and Mill Machinery are also large consumers at 13,000 and 10,000 tons, respectively. This information is shown in Exhibit F, page 5 of 6.

Valve companies located in Pennsylvania are Pittsburgh Brass, Rockwell, Walworth, Dresser, American, Bailey, and others.

Pennsylvania is the largest user of steel castings in Mill Machinery with consumers such as U.S. Steel, Bethlehem, J & L, Wean, Lukens, Mesta, and Mackintosh-Hemphill.

Nearly 50,000 tons of carbon steel castings are forecast for consumption in the State of Wisconsin in 1985, as is shown in Exhibit F, page 6 of 6. Major consumers are J. I. Case, Drott, Harnischfeger, Manitowoc, American Hoist, Allis Chalmers, and others.

The State of Illinois is not an exceptionally large consumer of corrosion resistant steels, as shown in Exhibit G, page 1 of 6. However, there are two large valve consumers, Rockwell (Hills-McCanna) and Pratt, in the state. Most of the valves purchased by these companies are in the 0 to 500 pounds weight range.

The consumption of corrosion resistant steel castings in Indiana, as shown in Exhibit G, page 2 of 6, is only slightly larger than in Illinois at 1,640 tons annually. The main consumers are Conval and ITT.

As shown in Exhibit G, page 3 of 6, the demand in Michigan is only 470 tons per year. In Ohio, however, it is forecast to consume 12,800 tons of stainless castings in 1985, as shown on page 4 of 6 of this exhibit. The largest valve producers, Conval, Xomax, Vogt, Ladish, Duriron, Brighton, and Crane Company, are located in Ohio or on the Kentucky border.

Pennsylvania is also a large consuming state for pumps and valves and other stainless castings. Goulds (Seneca Falls, New York) and Ingersoll-Rand (Phillipsburg, New Jersey) are large consumers of stainless pump castings near Pennsylvania. The state also has the majority of the stainless foundries, i.e., Quaker, Lebanon, Dodge, Empire, and Penn Steel. Exhibit G, page 5 of 6, shows the breakdown by weight range.

The main consumer of stainless castings in Wisconsin is Ladish, near Milwaukee, a valve producer. As is shown in Exhibit G, page 6 of 6, a total of 960 tons per year is forecast.

Exhibit H, pages 1 through 6, shows the demand for heat resistant steel castings. The largest demand is from manufacturers of furnaces and ovens located in Michigan (automotive), Ohio (automotive), and by heat treat equipment manufacturers in the other states.

Non-railroad manganese steel castings are primarily purchased for the Construction Equipment and Mining industry as shown in Exhibit J.

More in-depth information in regard to casting sizes is presented in Exhibit K. This exhibit provides the following information for each alloy composition projected for 1985.

- Total tonnage demand by state, by casting weight
- Domestic demand/supply ratio by casting weight
- Average 1983 selling price per pound, by casting weight
- Average 1983 domestic supplier production rate in man-hours per ton
- Average domestic supplier 1983 hourly labor wage rate (including fringe benefits)
- Projected 1985 import tonnage by casting weight

Exhibit K, pages 1 through 4, summarizes the market conditions by state and weight range and establishes competitivity comparisons.

It is to be noted that the labor rate (fringe loaded) does not vary significantly from state to state. It does vary as is shown by size range from $11.80/hour for foundries producing smaller castings to $11.00/hour for foundries producing larger castings. These are weighted averages and can be used for comparison. However, there are special cases where rates can be 40% to 50% higher.

Selling prices for carbon steel vary from $0.88 to $1.10 per pound, however, imports are known to be from $0.60 to $1.00 per pound. Carbon steel valve castings in large lots were normally priced at $1.10 to $1.30 per pound, but have been reduced to meet imports. A recent delivery of carbon steel valve castings from Spain, for example, was picked up at a New York dock for $0.90/pound.

Prices for corrosion resistant steel castings have been reduced to 1978 levels. For example, CF-8M valve bodies are being sold at $3.50 per pound with imports sometimes priced at 20% less.

The demand/supply conditions forecast for 1985 as shown indicate an overall surplus of supply for all castings under 5,000 pounds.

Exhibit L, pages 1 through 8, describes the distribution of casting weight ranges by percent of total tonnage consumed in each state. This is shown for analysis purposes only as the estimated tonnages were shown in Exhibit K.

Exhibit M has been developed to relate the 1985 projected demand, captive production, and import volume. This information is shown for each major market segment and alloy group and indicates the net tonnage available in each market segment for production by domestic or foreign commercial steel castings foundries.

The larger captive producers in Construction Equipment are Bucyrus-Erie (South Milwaukee, Wisconsin), American Hoist and Derrick (Minnesota and Michigan), and Marion Power Shovel (Ohio). The major steel companies, Bethlehem and U.S. Steel, have captive foundries in Pennsylvania. The major captive steel foundries servicing the truck industry are operated by Dayton Walther and Rockwell International. The total captive production of carbon and low alloy steel castings is estimated at approximately 45,500 tons, or less than 10% of the demand.

It is estimated that imports are equivalent to approximately 24% of the total demand for carbon steel castings with valve casting imports reported to be 40%.

The net available market for jobbing producers is shown for all market segments and is equal to demand less captive production.

Exhibit N further defines the projected demand/domestic supply and import conditions for 1985 including casting alloy group:

- Six-state regional demand by casting weight
- Six-state regional excess or shortage of domestic supply by casting weight
- Six-state regional import tonnage by casting weight

It is shown that shortages of supply are forecast to exist in the castings of 5,000 pounds and over.

SPECIAL ANALYSIS OF THE VALVES AND FITTINGS MARKET

A great deal of useful information has been made available by this and other similar projects on the subject of the relationship of the steel casting industry to the Valves and Fittings market in the United States. Some of the data considered to be of use to the Canadian Steel Castings Industry have been included in this report.

Exhibit P shows 31 companies considered to be the major manufacturers of valves in the United States and their 1983 projected tonnage demands for corrosion resistant and carbon and low alloy steel castings. The following additional information is presented:

- Manufacturing plant locations of the various firms
- Demand by casting size for sand molded castings
- Demand by casting size for shell molded castings

Manufacturers of Valves and Fittings in the United States are noticeably showing increased preference for steel castings up to 100 pounds produced by the investment molding process. Several benefits are cited for this trend.

Although the initial cost of the rough casting produced by the investment molding process is greater than that produced by conventional sand and shell molding methods, the high casting costs are reported to be offset by the following benefits:

- Reduction in initial foundry tooling costs
- Increased foundry tooling life
- Reduced machining costs
  - 27% less than sand castings
  - 7% less than shell castings
- Reduced casting weights
  - 25% less than sand castings
  - 10% less than shell castings

Approximately 23,000 tons of steel investment castings are expected to be used in the production of Valves and Fittings in 1983 with projected growth of 25% per year through 1985.

Exhibit R shows the projected demand for steel investment castings in the Valves and Fittings industry by state and alloy for 1983 and 1985. The investment casting industry is one of the few casting industries in which U.S. exports continue to exceed imports.

IMPORT CONDITIONS OF THE STEEL CASTINGS INDUSTRY

The domestic demand for steel castings, based on U.S. Bureau of Census information and data from societies and others, has normally been expressed in the weight or value of castings shipped from producing foundries. Exports were never known exactly, but always exceeded imports with U.S. demand expressed as being the same as shipments. It was, at the least, a conservative estimate and of little consequence.

Beginning in 1981, and accelerating in 1982 and 1983, imports of steel castings have gained rapidly and now exceed exports in most market sectors. It is, therefore, necessary to know the import conditions for each market section to determine the actual demand.

Based on reports from societies, producers, forecasters, and government information, the following import percentages have been developed for the market sectors discussed in this report. These percentages can be used to determine the tonnage imported in each state because individual statewide percentages are nonexistent.

$$\text{Imports/Demand} = \frac{\text{Imports (Tons)}}{\text{Total U.S. Demand (Tons)}}$$

	(Percentage) Carbon & Low Alloy Steel		(Percentage) Heat Resistant Steel		(Percentage) Corrosion Resistant Steel	
Market Sector	1983	1985	1983	1985	1983	1985
Valves	35	40	15	15	15	20
Turbines	30	30	-	-	-	-
Construction	26	30	-	-	-	-
Mining	17	20	17	20	-	-
Oil	26	30	16	20	-	-
Industrial Trucks	14	20	-	-	-	-
Roll Machinery	15	15	15	15	15	15
Specialty Industries	20	20	25	30	20	25
Pumps and Compressors	16	20	-	-	16	20
Industrial Ovens	-	-	15	20	-	-
Truck	17	20	-	-	-	-

Castings are imported because of the lower cost to the buyer at equivalent quality. Carbon steel valves are being purchased at delivered prices 15% to 20% below the lowest domestic prices. Other castings can be purchased at prices 5% to 15% below domestic prices.

The major exporters of steel castings to the United States are Japan, Canada, South Africa, Korea, Spain, Italy, France, Mexico, Taiwan, and India.

PREFERRED METHODS AND CHANNELS FOR SUPPLYING STEEL CASTINGS TO UNITED STATES MARKETS

An analysis has been made of U.S. steel foundries and end-use companies to determine preferred methods for market entry by Canadian foundries.

Imports of steel castings to this country from foreign countries are mainly made through agents in major U.S. cities, by export/import trade companies, and by specific foreign government associations. Their objective is to provide information to potential consumers on producing foundries in specific countries and let the consumer make direct contact with the foundries. It is, however, beneficial to have an aggressive sales plan. Many consumers send representatives to the exporting countries to visit foundries to solicit quotes. Originally, foreign producers were only interested in large quantity orders, however, this has changed. Many foundries now quote on small lot orders, depending on the size, metal, and specifications.

The main problems to the end users are responsiveness to change, responsiveness to quick delivery, replacement of scrapped castings, currency exchange values, customs documentation, service, metallurgical assistance, application engineering, and general goodwill. Of course, large cost reductions are often good trade-offs for these liabilities.

The objective of Canadian producers would be to provide all of the above, along with competitive pricing, while U.S. domestic demand/supply conditions are not favorable.

U.S. producers normally sell through direct sales in major consuming areas and use manufacturers' representatives in more remote areas. Direct sales programs are necessary in the following markets where salesmen must offer specialist services:

- Heat resistant steel castings for tubes and bends to ethylene and ammonia plants
- Carbon steel and alloy steel castings for nuclear power plants
- Corrosion resistant steel and high alloy castings for military usage
- Steel mill roll castings
- X-ray quality castings for high pressure applications

Direct sales is also important to large consumers such as:

Caterpillar Tractor
Deere & Co.
International Harvester
J. I. Case
Rockwell International

However, if a representative or agent is well known by the consumer, it is sometimes useful to use a representative for a faster entry. No matter which method is used, the large consumer normally visits the casting facility to determine its capabilities before approval is made to classify the foundry as a potential source.

One example of a sales organization of a typical Ohio foundry producing carbon steel is as follows:

Castings Sales Manager	Territory
One Sales Engineer -	Western Michigan Chicago Milwaukee
Two Sales Engineers -	Ohio Indiana Pennsylvania Illinois (except Chicago)
Three Sales Representatives -	Southwestern U.S. Eastern U.S. Special Ohio Accounts
One Sales Service Specialist -	Quality troubleshooter and regular customer visitation

The following major entry barriers exist and must be overcome to achieve successful penetration of the subject market sectors:

- Valves
  - No unusual major barriers as imports are near 40%.
  - Casting quality must be acceptable.
  - Must compete with other nondomestic suppliers.
- Construction Equipment
  - Major consumers require qualification acceptance.
  - Strong consumer loyalties to suppliers exist.
  - Price retaliation by long-term suppliers is exercised.
- Mining Equipment
  - Must compete with established nondomestic suppliers.
  - Barriers considered to be similar to the Construction Equipment sector.

- Trucks, Buses, and Trailers
  - Supplier loyalty very important.
  - Must show substantial price advantages.
  - Major consumers require qualification acceptance.
  - Must be responsive to delivery schedules and impromptu order changes as consumers carry minimal inventories.

In order to remove the major entry barriers, the following suggestions should be considered:

- Be competitive with other foreign country producers.
- Qualify for large consuming companies.
- Use a direct sales approach to large companies.
- Use representatives to cover specific areas when representatives have special contacts with major consumers.

COMPETITIVITY AND PENETRATION POTENTIAL OF CANADIAN STEEL CASTING FOUNDRIES

The definition of "Competitive" means many things to consumers and suppliers in the United States steel castings markets. Generally, each of the following characteristics attributed to a supplier foundry is weighted differently by the various consumers:

- Dollar cost of the casting
- Quality of the casting
- Special services provided, such as application engineering assistance and field service
- Prompt adherence to delivery schedules
- History of customer/supplier relationships and the fostered loyalties

The interview survey conducted during this project and confirmed by other recent Knight studies indicates little or no reluctance toward the use of imported castings by United States consumers if cost advantages can be achieved and quality levels are acceptable.

Canadian steel casting producers considering entry into the United States steel casting market must know their position relative to the domestic commercial castings foundries and the other foreign suppliers with whom they must compete.

Exhibit 5 has been prepared to show the United States steel castings foundries considered to be among the most competitive within the six-state region addressed in this report. This exhibit identifies the industries serviced by the foundry, its nominal annual capacity, the alloys produced, and the productivity level in man-hours per ton. Productivity indices (man-hour/ton), of course, vary significantly depending on product mix. Based on product mix, competitivity comparisons can be made. However, it must be recognized that selling price comparisons give one a better comparison of competitivity.

Although this information can be used as a guideline, it must be recognized that geographical regions of supply in relationship to the location of the consumer are considered to be irrelevant.

The dominate factor affecting increased penetration of the United States steel casting market by Canadian foundries is cost of castings to the consumer. There are other factors, however, which are considered to have impact. The major markets have been reviewed in relation to these factors and some subjective evaluations made as to their effect on increased Canadian penetration.

- Competitivity and Pricing - The most competitive market, currently, is the Valves and Fittings sector followed by Construction Equipment, and Trucks, Buses, and Trailers. The high piece part volume requirements for Valves and Construction Equipment make them good candidates for long run volume producers generally operating with low manufacturing costs. The Truck, Bus, and Trailer market, in spite of volume requirements, has tended to favor domestic supply.

  The major consumers in this market are finished component producers who require excellent communication, quality, engineering, and field service from suppliers who can respond to short notice design and order changes.

  Potential for increased penetration is considered to be favorable in the Valves and Fittings sector based on knowledge currently in-house relating to exporting foundries and especially toward the corrosion resistant castings projected for demand increases of 33% per year through 1985. Favorable demand supply conditions for the larger, low volume castings should enhance the potential.

  The greatest opportunity is considered to exist for the large, low volume carbon and low alloy, and corrosion resistant castings over 5,000 pounds in which supply shortfalls of between 5% and 10% are projected on an industrywide basis.

- Delivery Requirements - Important, but normally not a problem for import suppliers if customary casting lead times are adhered to.

- Service Requirements - This factor was not cited as an important criteria in purchasing castings, although it is common knowledge that the major Construction Equipment producers and the Truck, Bus, and Trailer market place great emphasis on this service. Canada, with close proximity to these markets, should have a distinct advantage over other foreign producers.

- Quality - Quality does not appear to have been a major deterrent to foreign foundries. It is felt, however, that exporters of steel castings to the United States have not substantially penetrated the markets which require the higher quality, sophisticated castings. Canadian foundries may very well be competitive with the U.S. suppliers of these castings. The high tech/high quality castings are primarily associated with the following markets in the large casting size ranges:

  - Engines and Turbines
  - Valves and Fittings, both carbon and corrosion resistant
  - Special Industry Machinery
  - Pumps, carbon and low alloy, and corrosion resistant steels

- Personal Relationships - It is difficult to evaluate personal relationships between suppliers and consumers. More important are the value of long-term supplier/customer associations, especially in the smaller less dominate markets. These relationships have been fostered through the years and have served the supplier with stable customers and the customer with guaranteed supply during industry demand peaks.

- Representation - Addressed in a previous section of this report.

- Geographical - Except in the Oil Field Equipment industry where both demand and supply are concentrated in Alabama, Mississippi, Louisiana, Arkansas, Oklahoma, Texas, and California, the proximity of supplier to customer is not relative.

- Freight, Custom Duties, Casting Price - These three factors cannot be considered on an individual basis, as the sum of the three represent the total cost to the consumer. Freight costs for Canadian suppliers in the industrial areas of Ontario and Quebec which are adjacent to the six-state market should provide advantages over other foreign suppliers and be competitive with out-of-region U.S. domestic foundries.

  The impact of customs tariffs was agreed to be outside the scope of this study. They must be considered, however, as a part of the total consumer casting cost. When considering the current major exporters of steel castings to the United States, it is not felt that Canada would be at a comparative disadvantage. It should be noted, however, that the current high level of imported steel castings has resulted in increased pressure from the U.S. steel castings producers for legislation which would provide some form of import relief. The present administration has generally opposed trade restrictions of this nature and has given no indication of forthcoming policy changes. Should restrictive measures be adopted, the opportunity for Canada and other exporting countries could be adversely effected.

  Actual casting price is the third major component of cost to the consumer. Selling prices of castings produced by domestic U.S. foundries have been established for the various alloys and casting size ranges (Refer to Exhibit K). These prices are considered to be based on actual production costs and include nominal profit margins relative to the markets serviced. It has, however, been impossible to establish the actual manufacturing cost of foreign suppliers. It is common knowledge that labor costs are lower in some foreign countries, but it is sometimes difficult to establish the government support levels provided to encourage exports.

- Demand/Supply - Domestic U.S. demand/supply conditions have had little effect on import volumes of the major markets where casting cost is indicated as a primary criteria of purchase.

- Profit Margin Potential - Profit margin potential for the Canadian exporting foundry is considered to be most favorable in the markets exerting minimal overall pricing leverage. Included among these markets are:

  - Carbon and Low Alloy Castings

    Tools and Dies
    Special Industry Machinery
    Pumps
    Motors and Generators

  - Corrosion Resistant Castings

    Special Industry Machinery
    Pumps (Excellent growth potential)
    Valves (Excellent growth potential)

Giving consideration to the overall steel casting demand in the United States, the excess supply capability of domestic foundry capacity, and the ever-increasing volume of imported castings consumed in most market segments, indicates that the primary competitors to Canadian steel foundries for the U.S. steel castings market are foreign suppliers.

CONCLUSIONS

The six-state region of Illinois, Indiana, Michigan, Ohio, Pennsylvania, and Wisconsin addressed in this study are considered to generate approximately 63% of the non-railroad steel castings demand in the United States.

Although the production capacity of non-railroad related steel castings in the six-state region is considered to exceed demand, there are no geographic distinctions regarding supply in relationship to the location of the consumer. All six states import and export steel castings between states within the region and outside the region.

The foreign importation of castings is having a greater effect on the steel casting segment than any other area of the cast metals industry even though domestic supply exceeds demand.

Provided quality is acceptable, purchase cost of castings to the consumer is still the primary purchasing criteria. Since a competitivity analysis of the Canadian steel casting producers is outside the scope of this study and has not been developed, it must be assumed that some of the foreign facilities are competitive in the world market as many currently export to the United States.

Although United States consumer/supplier relationships and loyalties exist to some extent, consumers show little, if any, reluctance to foreign supply. Canadian steel foundries must consider the pricing of other foreign sources of supply as their major entry barrier for greater penetration of the United States steel casting market. Competitivity comparisons must be made by individual steel foundries in order to evaluate their potential for entry or increased penetration in the export of steel castings to U.S. markets.

Growth markets which offer potential for participation in the U.S. market for steel castings are:

- Greater than 1,000 pounds carbon and corrosion resistant steel markets where a supply shortage could exist
- The O.E.M. Construction Equipment market where a concentration of large consumers exists in Illinois and Ohio
- Valve market for foundries which can offer competition to other foreign suppliers
- Pump casting market for foundries which can produce many alloys from single pattern equipment
- Mill Machinery Equipment in Pennsylvania and Ohio where demand/supply conditions indicate possible shortages

EXHIBITS

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

STEEL CASTING CONSUMERS AND INTERVIEWS

Market and Company	Contact and Position	Projected 1983 Demand Tons	Casting Weight Ranges: Tons by Group and Purchase Costs Where Available/Pound — Under 100 Lbs.	101 to 500 Lbs.	501 to 1,000 Lbs.	1,001 to 5,000 Lbs.	5,001 to 10,000 Lbs.	Over 10,000 Lbs.	Purchasing Criteria	Foreign Procurement Policies
A. Valves and Fittings										
1. Pipeline Development Co. 1831 Columbus Road Cleveland, OH 44113 216-696-7055	E. V. Rogers Purchasing Dept.	1,000 Carbon			1,000 $0.84				1. Quality 2. Price	Open if Price and Quality Acceptable
2. Rockwell International 400 Maple Avenue Carpentersville, IL 60110		2,015 Carbon	1,100	500	185	85	60	75	1. Quality 2. Price	Open - Currently Some Foreign Procurement
1900 South Saunders Raleigh, NC 27602		510 Corrosion	290	90	60	30	30	10		
3. Posi-Seal International Routes 49 and 95 North Stonington, CT 06359 203-599-1140	A. Martin Purchasing Dept.	3,680 Carbon	2,190 $1.50	960 $1.50	370 $1.50	110	50		1. Quality	Open - Currently Some Foreign Procurement
		820 Corrosion	570 $3.70	170 $3.70	60 $3.70	10	10			
4. Jamesbury Corporation 640 Lincoln Street Worcester, MA 01613 617-852-0200	D. J. Bucca Purchasing Dept.	2,400 Carbon	1,000	430	150	75			1. Quality 2. Price	Open - Currently Some Foreign Procurement
		1,640 Corrosion	1,300	260	60	10	10			
5. Xomox Corp. (Emerson Electric) 444 Cooper Cincinnati, OH 513-745-6000	R. Stretch	1,125 Carbon	740 $1.75	260 $1.75	75	30	20		1. Quality 2. Price	Open - Currently Some Foreign Procurement
		1,190 Corrosion	900 Ave $3.75	200 Ave $3.75	60	20	10			
6. Fisher Controls International 205 South Center Marshalltown, IA 50158 515-754-3011	R. B. Franklin	2,620 Carbon	2,050	570					1. Quality 2. Price	Open - Currently Some Foreign Procurement
200 Main Street Coraopolis, PA 15108		170 Corrosion	170							
Highway 380 and Highway 5 McKinney, TX 75069										
U.S. Highway 75 Sherman, TX 75090										

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DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

STEEL CASTING CONSUMERS AND INTERVIEWS

Market and Company	Contact and Position	Projected 1983 Demand Tons	Casting Weight Ranges — Tons by Group and Purchase Costs Where Available/Pound: Under 100 Lbs.	101 to 500 Lbs.	501 to 1,000 Lbs.	1,001 to 5,000 Lbs.	5,001 to 10,000 Lbs.	Over 10,000 Lbs.	Purchasing Criteria	Foreign Supply Policies
A. Valves and Fittings (Continued)										
7. Conval, Inc.		2,960 Carbon	1,040	1,175	370	150	150	75	1. Quality 2. Price	Open
CDV Inc. 1106 North Main Orville, OH 44667 216-682-5060	W. L. Stine	600 Corrosion	290	110	110	30	30	30		
Hammond Valve Corp. 1844 Summer Street Hammond, IN 46320										
Lunkenheimer Co. Bookman & Waverly Cincinnati, OH 54214	A. Lestingi									
B. Mining Machinery										
1. Lake Shore Inc. 900 West Breitung Iron Mountain, MI 49855 906-774-1500	D. Bruneau Purchasing Agent	75 Carbon	25 $1.20	35 $1.10			15 $1.00		1. Price	Open - Prefers Domestic
2. Euclid Inc., Daimler Benz 22221 St. Clair Avenue Cleveland, OH 44117 216-38?-5000	A. Hogan Casting Buyer	4,000 Carbon	100 $0.70	2,800 $0.80	800 $0.80	300 $0.65			1. Quality 2. Price	Open
3. Joy Manufacturing Co. 300 Fleming Road Birmingham, AL 35217		600 Carbon	300	200	100				1. Quality 2. Price	None - Currently Some Foreign Procurement
3790 Wheeling Denver, CO 80239		300 Corrosion	200	100						
River Road Claremont, NH 03743										
120 Liberty Street Franklin, PA 16323										

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OTTAWA, CANADA

STEEL CASTING CONSUMERS AND INTERVIEWS

Market and Company	Contact and Position	Projected 1983 Demand Tons	Casting Weight Ranges — Tons by Group and Purchase Costs Where Available/Pound: Under 100 Lbs.	101 to 500 Lbs.	501 to 1,000 Lbs.	1,001 to 5,000 Lbs.	5,001 to 10,000 Lbs.	Over 10,000 Lbs.	Purchasing Criteria	Foreign Supply Policies
B. Mining Machinery (Continued)										
4. Owen Bucket - Division of Anvil Attachments, Inc. 10101 Brecksville Road Brecksville, OH 44141 216-526-1167		410 Carbon	100 $1.30	250 $1.10	30 $1.00	30 $0.80			1. Price	Open
5. FMC Corporation 1201 Sixth Street, S.W. Cedar Rapids, IA 319-398-3200	Mr. Lintz Purchasing Manager	300 Carbon	100	150	50				1. Price	Open
		300 Wear Resist	50	200	50					
6. Atlas Copco, Jarva Inc. 29195 Hall Street Cleveland, OH 44139 216-248-0166	T. Dzurille Manager Purchasing	300 Carbon	150	75	50	25			1. Quality 2. Price	Preference Domestic, but No Policy
7. American Alloy Corp. 3000 East 87th Street Cleveland, OH 44104		1,450 Carbon	750	650	50				1. Price 2. Quality	Imports Approximately 90% Far East and South Africa
C. Motors and Generators										
1. Babcock & Wilcox Co. Inc. 20 South Van Buren Barberton, OH 44203 216-753-4511	E. P. Preseruk	450 Carbon		300 $1.20		150 $1.00			1. Quality	Open
2. Magnetics International 5400 Dunham Road Cleveland, OH 44137 216-662-8484	E. Richard	1,450 Carbon	30 $1.35	120 $1.20	150 $1.20	350 $0.95	800 $0.85		1. Price	Open
3. Allis Chalmers Corp. 1126 South 70th Street West Allis, WI 53214 414-475-2000	R. George Casting Buyer	1,500 Carbon	1,500						1. Price	Imports When Price Is Competitive

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DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

STEEL CASTING CONSUMERS AND INTERVIEWS

Market and Company	Contact and Position	Projected 1983 Demand Tons	Casting Weight Ranges — Tons by Group and Purchase Costs Where Available/Pound: Under 100 Lbs.	101 to 500 Lbs.	501 to 1,000 Lbs.	1,001 to 5,000 Lbs.	5,001 to 10,000 Lbs.	Over 10,000 Lbs.	Purchasing Criteria	Foreign Supply Policies
D. Furnaces and Ovens										
1. Surface Combustion Div. Midland-Ross Corp. 2375 Dorr Street Toledo, OH 43607 419-537-6176	R. L. Woodruff Director Purchasing	250 Heat Resist	250 $2.40						1. Price	Open
2. Selas Corporation of America Limekiln Pike Dresher, PA 19025 215-646-6600	Mr. Semmer Casting Buyer	50 Carbon 200 Heat Resist	50 $1.20 200 $2.40						Price and Quality Equal	Open
E. Construction Equipment										
1. Deere & Company 1100 13th Avenue East Moline, IL 61244 309-752-6310	J. Prey	3,500 Carbon 150 Corrosion 150 Wear Resist	2,500 100 50	1,000 50 100					1. Price 2. Quality	Present Imports Minimal
2. Terex Corporation 5405 Darrow Road Hudson, OH 44236 216-655-5000 8500 Clinton Road Cleveland, OH 44144		2,000 Carbon	1,200 $1.12	400 $1.05	250 $0.90	150 $0.90			Price and Quality Equal	Has Imported - Not Currently
3. Fiat-Allis 3000 South 6th Street Springfield, IL 62703 217-789-3000	B. Haighe Casting Buyer	1,900 Carbon 500 Corrosion	1,100 400	400 100	250	150			1. Price 2. Quality	Imports South Africa as Cost Dictates
4. Manitowac Co. Inc. 500 South 16th Street Manitowac, WI 54220 414-684-6621	K. Svacina Casting Buyer	2,800 Carbon	800	800	800	400			1. Price 2. Service	Open
5. Warner & Swasey 406 Mill Avenue, S.W. New Philadelphia, OH 44663 216-339-2211	D. Wittingham	1,100 Carbon	650	400	50				Quality and Price Equal	Open

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DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

STEEL CASTING CONSUMERS AND INTERVIEWS

Market and Company	Contact and Position	Projected 1983 Demand Tons	Casting Weight Ranges — Tons by Group and Purchase Costs Where Available/Pound: Under 100 Lbs.	101 to 500 Lbs.	501 to 1,000 Lbs.	1,001 to 5,000 Lbs.	5,001 to 10,000 Lbs.	Over 10,000 Lbs.	Purchasing Criteria	Foreign Supply Policies
E. Construction Equipment (Continued)										
6. Caterpillar Tractor Co. Aurora, IL Decatur, IL Joliet, IL Peoria, IL Milwaukee, WI York, PA		45,000 Carbon 800 Wear Resist	12,000 100	20,000 500	9,600 200	3,400			1. Quality 2. Price	Open
7. Gallon Mfg. (Dresser Ind.) South Street Gallon, OH 44833 419-468-4321 Dresser Industries Libertyville, IL	W. Askino Purchasing Agent	2,400 Carbon	1,500	900					Price and Quality Equal	Open
8. Harnischfeger Corp. Box 554 Milwaukee, WI 53201 414-671-4400 Schiller Park, IL Cedar Rapids, IA Escanaba, MI Oak Creek, WI		3,200 Carbon 800 Manganese	300 $1.05 500 $1.40	1,00 $0.95 200 $1.40	800 $0.90 100 $1.40	800 $0.90	300 $0.80		1. Quality	Open
F. Truck, Bus, Trailer, and Other Motor Vehicle										
1. White Motor, Volvo 842 East 79th Street Cleveland, OH 44103 216-431-2000	F. Botek Purchasing Dept.	4,000 Carbon	3,200 $1.30	800 $1.00					Quality and Price Equal	Currently Imports If Prices Acceptable
2. Perfection Cobey-Hersco 320 South East Street Galion, OH 44833 419-468-5212	P. Metzger	250 Carbon	250 $1.40						1. Price	Open Volumes Too Low
3. Dura Corp. - Dura/Weaver 4500 North Detroit Toledo, OH 43612 419-476-2201	J. Reeves	160 Carbon	160 $1.40						1. Price	Open

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DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

STEEL CASTING CONSUMERS AND INTERVIEWS

Market and Company	Contact and Position	Projected 1983 Demand Tons	Casting Weight Ranges — Tons by Group and Purchase Costs Where Available/Pound: Under 100 Lbs.	101 to 500 Lbs.	501 to 1,000 Lbs.	1,001 to 5,000 Lbs.	5,001 to 10,000 Lbs.	Over 10,000 Lbs.	Purchasing Criteria	Foreign Supply Policies
F. Truck, Bus, Trailer, and Other Motor Vehicle (Continued)										
4. International Harvester 2069 LaGonda Springfield, OH 45501 513-390-4000	R. Potter	4,500 Carbon	3,200	650	650				1. Price	Currently Imports
5. Neway Div. - Lear Siegler 1950 Indianapolis Boulevard Muskegon, MI 49433 616-773-3271		880 Carbon	880 $1.10						1. Price	Open
6. Rockwell International Knox, IN Winchester, KY Marysville, OH Newark, OH Newcastle, PA Oshkosh, WI		9,600 Carbon	3,700	5,000	800	100			1. Price 2. Quality	Imports as Required
G. Machine Tools										
1. National Acme (Acme-Cleveland) 170 East 131st Street Cleveland, OH 44108 216-268-4200		400 Carbon	400 $1.50 to $2.20						1. Price 2. Quality	Open
H. Special Industry Machinery										
1. Portage Machine Co. Inc. 1021 Sweitzer Avenue Akron, OH 44311 216-762-0211	R. Suarez	480 Carbon	40 $1.00	40 $0.80		400 $0.60			1. Quality 2. Price	Open
2. National Machinery Co. Grovefield Street Tiffin, OH 44883 419-447-5211	L. Baker	440 Carbon			40 $1.00	400 $0.90			1. Price 2. Quality	Open

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DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

STEEL CASTING CONSUMERS AND INTERVIEWS

Market and Company	Contact and Position	Projected 1983 Demand Tons	Casting Weight Ranges — Tons by Group and Purchase Costs Where Available/Pound: Under 100 Lbs.	101 to 500 Lbs.	501 to 1,000 Lbs.	1,001 to 5,000 Lbs.	5,001 to 10,000 Lbs.	Over 10,000 Lbs.	Purchasing Criteria	Foreign Supply Policies
I. Industrial Trucks										
1. Clark Equipment Co. 324 Dewey Buchanan, MI 49107 616-697-8000	C. De Poy	1,000 Carbon	1,000 $1.30						1. Price	
2. Hyster Company 1813 East Voorhees Danville, IL 61832 Highway 278E Selligent, AL 35586 2000 Kentville Road Kewanee, IL 61443		900 Carbon	900 $1.30						Price and Quality Equal	
3. Towmotor Corp. (Caterpillar) 7800 Tyler Boulevard Mentor, OH 44060 216-255-5611	M. Burdett	100 Carbon	100						1. Quality	
J. Mill Machinery										
1. Production Experts 4259 East 49th Street Cleveland, OH 44125 216-794-2121		700 Carbon				50 $0.60	150 $0.60	500 $0.60	1. Price	Open
2. Republic Steel Corp. 3100 East 45th Street Cleveland, OH 44127 216-622-5000		1,600 Carbon	100 $0.97	200 $0.97	200 $0.97	400 $0.90	600 $0.90	100 $0.90	1. Quality 2. Price	Open
3. E. W. Bliss (Gulf & Western) 430 South Ellsworth Salem, OH 44460 216-337-3445	M. Carek	2,300 Carbon	50 $1.10	50 $0.95	100 $0.85	500 $0.85	1,000 $0.65	600 $0.65	1. Quality 2. Price	Open
4. Pollack Co. 101 Andrews Avenue Youngstown, OH 44503 216-743-5155	W. Hill	610 Carbon	10 $0.90	50 $0.90	50 $0.90	200 $0.90	300 $0.90		1. Quality	Open

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DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

STEEL CASTING CONSUMERS AND INTERVIEWS

Market and Company	Contact and Position	Projected 1983 Demand Tons	Casting Weight Ranges — Tons by Group and Purchase Costs Where Available/Pound: Under 100 Lbs.	101 to 500 Lbs.	501 to 1,000 Lbs.	1,001 to 5,000 Lbs.	5,001 to 10,000 Lbs.	Over 10,000 Lbs.	Purchasing Criteria	Foreign Supply Policies
J. Mill Machinery (Continued)										
5. Wean United 3805 Hendricks Road Youngstown, OH 44501 216-792-9011	J. Owens	2,000 Carbon	100	200	200	1,400	100		1. Quality 2. Price	Open
6. Armco, Inc. 912 Cheney Avenue Marion, OH 44302 614-383-4011		700 Carbon	40	100	100	160	200	100	1. Price	Open
7. Bethlehem Steel Corp. 701 East 3rd Street Bethlehem, PA 18016 U.S. Highway 12 Portage, IN 46368 Sparrows Point Road Baltimore, MD 21219 119 Walnut Johnstown, PA 15907 Front and Swatara Streets Steelton, PA 17113	J. Walsh	820 Carbon 200 Heat Resist	10 40	10 100	40 60	110	250	400	1. Quality	Open
8. Jones & Laughlin Mill Street Aliquippa, PA 15001 412-378-6011 3 Gateway Center Pittsburgh, PA 15263 305 Gateway View Plaza Pittsburgh, PA 15219	Mill Castings	1,500 Carbon	100	200	200	350	450	200	1. Quality 2. Price	Open
	Piercer Point Castings	Points	1,500 $1.00							
		Plugs	500 $1.50							
		Guide Shoes	560 $1.50							
		Peeler Shoes	50 $1.50							

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DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

STEEL CASTING CONSUMERS AND INTERVIEWS

Market and Company	Contact and Position	Projected 1983 Demand Tons	Casting Weight Ranges — Tons by Group and Purchase Costs Where Available/Pound: Under 100 Lbs.	101 to 500 Lbs.	501 to 1,000 Lbs.	1,001 to 5,000 Lbs.	5,001 to 10,000 Lbs.	Over 10,000 Lbs.	Purchasing Criteria	Foreign Supply Policies
J. Mill Machinery (Continued)										
9. U.S. Steel Plant Locations: Johnstown, PA Fairless Hills, PA Oil City, PA Lorain, OH Canton, OH Massury, OH Gary, IN	Mill Castings	3,000	200	300	400	600	1,000	500	1. Quality 2. Price	Open
	Piercer Point Castings									
		Points	3,000 $1.00							
		Plugs	1,000 $1.50							
		Guide Shoes	1,000 $1.50							
		Peeler Shoes	100 $1.50							
K. Pumps										
1. Commercial Shearing Inc. 1775 Logan Youngstown, OH 44501 216-746-8011	R. Simons	300 Carbon	300 $1.30						1. Price	Open
2. Hyco Div. of Weatherhead Co. 1401 Jacobson Avenue Ashland, OH 44805 419-323-1593		800 Carbon	800 $1.30						1. Quality 2. Price	Open
3. Worthington Pump 10 Lower Westfield Road Holyoke, MA 01040 413-536-0600	Mr. Kilrain	1,400 Carbon	100	200	400	300	300	100	1. Quality	Open
		350 Corrosion		40	100	150	50	10		
4. Goulds Pumps Inc. 240 Fall Street Seneca Falls, NY 13148 315-568-5881	R. McKnight	1,400 Carbon	300	400	600	100			1. Quality	Open
		350 Corrosion	100	100	50	25				
5. Standard Pump Div. Ingersoll-Rand 1 Pump Place Allentown, PA 18105 215-776-6100		1,750 Carbon	75	400	800	400	75		1. Quality 2. Price	Open
		350 Corrosion	15	50	150	100	25	10		

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DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

STEEL CASTING CONSUMERS AND INTERVIEWS

Market and Company	Contact and Position	Projected 1983 Demand Tons	Casting Weight Ranges — Tons by Group and Purchase Costs Where Available/Pound: Under 100 Lbs.	101 to 500 Lbs.	501 to 1,000 Lbs.	1,001 to 5,000 Lbs.	5,001 to 10,000 Lbs.	Over 10,000 Lbs.	Purchasing Criteria	Foreign Supply Policies
K. Pumps (Continued)										
6. Dean Brothers Pumps Inc. 6040 Guion Road Post Office Box 68172 Indianapolis, IN 46268 317-293-2930	Mr. Singleton	210 Carbon 70 Corrosion	100 50	110 20					1. Quality 2. Price	
7. Chempump Div. (Crane) Warrington Industrial Park Warrington, PA 18976 215-343-6000	R. Siefken	50 Carbon 20 Corrosion	50 20						1. Quality	
8. Deming Div. (Crane) 884 South Broadway Salem, OH 44460 216-337-7861	Mr. Warren	700 Carbon 210 Corrosion	50 25	200 135	400 50	50			1. Quality	Open
L. Tanks - Military										
1. General Dynamics 6000 - 17 Mile Road Detroit, MI 48231 175 East Street Eynon, PA 18403 1155 Buckeye Road Lima, OH 45804		7,000 Low Alloy	1,000 $2.16		1,200 $2.00	1,800 $2.00	3,000 $2.00		1. Quality	Open

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DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

PROJECTED 1983 AND 1985 CARBON AND LOW ALLOY
STEEL CASTING DEMAND BY MARKET SEGMENT AND STATE

Market	SIC	1983 Annual Tons	Compounded Annual Growth 1983-1985	Illinois		Indiana		Michigan		Ohio		Pennsylvania		Wisconsin		Other States Or Unidentified		Total Tons	
				Tons 1983	Tons 1985	Tons 1983	Tons 1985	Tons 1983	Tons 1985	Tons 1983	Tons 1985	Tons 1983	Tons 1985	Tons 1983	Tons 1985	Tons 1983	Tons 1985	Tons 1983	Tons 1985
Municipal and Construction	1611																		
Heating-Nonelectric	3433																		
Boiler Products	3443																		
Valves and Fittings	3494	70,000	16.0%	1,900	2,600	4,200 (1)	5,700	700	1,000	18,200 (2)	24,700	9,600 (3)	13,100	2,600	3,500	32,800	44,400	70,000	95,000
Engines and Turbines	3511-19	18,000	Flat	650	650	2,800	2,800	2,100	2,100	500	500	3,800	3,800	400	400	7,750	7,750	18,000	18,000
Farm Equipment	352	5,000	Flat	1,500	1,500									500	500	3,000	3,000	5,000	5,000
Construction Equipment	3531	156,000	11.0%	64,600	79,400	8,200	10,000	9,800	11,900	17,800	21,800	10,800	13,200	24,200	29,700	20,600	26,000	156,000	192,000
Mining Equipment	3532	103,000	12.0%	6,000	7,700	8,300	10,500	1,000	1,400	28,500	35,800	15,700	19,700	14,700	18,500	28,800	36,400	103,000	130,000
Oil Field Equipment	3533	34,000	5.0%	100	150	100	150			700	850	2,000	2,200	100	150	31,000	34,000	34,000	37,500
Industrial Trucks	3537	4,000	11.0%	100	125			1,000	1,250	100	125	500	625			2,300	2,875	4,000	5,000
Machine Tools	3541	3,000	Flat	100	100			400	400	700	700			300	300	1,500	1,500	3,000	3,000
Tools and Dies	3544	4,000	Flat	100	100			1,200	1,200	1,000	1,000	400	400			1,300	1,300	4,000	4,000
Mill Machinery	3547	36,000	2.0%	850	900	4,100	4,300	350	350	13,500	14,000	9,500	9,900	500	550	7,200	7,500	36,000	37,500
Metal Work Machinery	3549	10,000	7.0%													10,000	11,500	10,000	11,500
Special Industry Machinery	3559	8,000	7.0%													8,000	9,000	8,000	9,000
Pumps	3561	10,000	20.0%	410	600	450	650	50	80	2,240	3,200	3,770 (4)	5,400	40	70	3,040	4,400	10,000	14,400
Blowers and Fans	3564																		
Power Transmissions	3566	4,000	11.0%	600	750	800	1,000					200	250	600	750	1,800	2,250	4,000	5,000
Furnaces and Ovens	3567																		
Motors and Generators	3621	5,000	5.0%			300	330			750	825	500	550	750	825	2,700	2,970	5,000	5,500
Trucks, Buses, Trailers	3713-15	116,000	4.0%	3,000	3,200	2,500	2,700	45,000	48,500	28,000	30,000	2,000	2,100	5,000	5,500	30,500	33,000	116,000	125,000
Shipbuilding	373	2,000	Flat													2,000	2,000	2,000	2,000
Railroad Equipment	3743	436,000	9.0%													436,000	518,000	436,000	518,000
Tanks (Military)	3795	7,000	5.0%					1,000	1,100	2,000	2,200	2,000	2,200			2,000	2,200	7,000	7,700
Other		24,000	10.0%	2,200	2,266	880	880	1,727	1,606	3,146	3,145	1,672	1,705	1,375	1,408	13,000	18,000	24,000	29,000
Totals		1,055,000		82,110	100,041	32,630	39,010	64,327	70,886	117,136	138,835	62,442	75,130	51,065	62,153	645,290	768,045	1,055,000	1,254,100
Percent of Total Tons		92.3																	

(1) Includes major Louisville, Kentucky consumer (Henry Vogt Machine Co.)

(2) Includes major Cynthiana, Kentucky consumer (Ladish Co.)

(3) Includes two major New Jersey consumers (Walworth - Linden, New Jersey; Leslie Co. - Parsippany, New Jersey)

(4) Includes major New York consumer (Goulds Pumps, Inc. - Seneca Falls, New York)

EXHIBIT B

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

PROJECTED 1983 AND 1985 CORROSION RESISTANT STEEL CASTING DEMAND BY MARKET SEGMENT AND STATE

Market	SIC	1983 Annual Tons	Compounded Annual Growth 1983-1985	Illinois Tons 1983	Illinois Tons 1985	Indiana Tons 1983	Indiana Tons 1985	Michigan Tons 1983	Michigan Tons 1985	Ohio Tons 1983	Ohio Tons 1985	Pennsylvania Tons 1983	Pennsylvania Tons 1985	Wisconsin Tons 1983	Wisconsin Tons 1985	Other States Or Unidentified Tons 1983	Other States Or Unidentified Tons 1985	Total Tons 1983	Total Tons 1985
Municipal and Construction	1611																		
Heating-Nonelectric	3433																		
Boiler Products	3443																		
Valves and Fittings	3494	17,000	33.0%	500	900	600 (1)	1,000	150	300	5,200 (2)	9,200	2,600 (3)	4,600	400	700	7,550	13,300	17,000	30,000
Engines and Turbines	3511-19	1,000	Flat													1,000	1,000	1,000	1,000
Farm Equipment	352																		
Construction Equipment	3531																		
Mining Equipment	3532																		
Oil Field Equipment	3533	1,000	5.0%																
Industrial Trucks	3537															1,000	1,100	1,000	1,100
Machine Tools	3541																		
Tools and Dies	3544																		
Mill Machinery	3547	1,000	2.0%																
Metal Work Machinery	3549															1,000	1,050	1,000	1,050
Special Industry Machinery	3559	5,000	7.0%	150	170	170	190	50	60	1,600	1,750	750	875	110	130	2,170	2,525	5,000	5,700
Pumps	3561	6,000	20.0%	280	400	200	290	40	60	420	600	1,400 (4)	2,000	30	50	3,630	5,200	6,000	8,600
Blowers and Fans	3564																		
Power Transmissions	3566																		
Furnaces and Ovens	3567																		
Motors and Generators	3621																		
Trucks, Buses, Trailers	3713-15																		
Shipbuilding	373	2,000	Flat																
Railroad Equipment	3743															2,000	2,000	2,000	2,000
Tanks (Military)	3795																		
Other		6,000	10.0%	130	160	130	160	40	50	1,100	1,250	725	825	75	80	3,800	4,675	6,000	7,200
Totals		39,000		1,060	1,630	1,100	1,640	280	470	8,320	12,800	5,475	8,300	615	960	22,150	30,850	39,000	56,650
Percent of Total Tons		3.4																	

(1) Includes major Louisville, Kentucky consumer (Henry Vogt Machine Co.)

(2) Includes major Cynthiana, Kentucky consumer (Ladish Co.)

(3) Includes two major New Jersey consumers (Walworth - Linden, New Jersey; Leslie Co. - Parsippany, New Jersey)

(4) Includes major New York consumer (Goulds Pumps, Inc. - Seneca Falls, New York)

EXHIBIT C

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

PROJECTED 1983 AND 1985 HEAT RESISTANT
STEEL CASTING DEMAND BY MARKET SEGMENT AND STATE

Market	SIC	1983 Annual Tons	Compounded Annual Growth 1983-1985	Illinois		Indiana		Michigan		Ohio		Pennsylvania		Wisconsin		Other States Or Unidentified		Total Tons	
				Tons 1983	Tons 1985	Tons 1983	Tons 1985	Tons 1983	Tons 1985	Tons 1983	Tons 1985	Tons 1983	Tons 1985	Tons 1983	Tons 1985	Tons 1983	Tons 1985	Tons 1983	Tons 1985
Municipal and Construction	1611																		
Heating-Nonelectric	3433	1,000	5.0%	40	40	45	45	15	15	120	120	185	195	35	35	560	650	1,000	1,100
Boiler Products	3443	1,000	5.0%	150	175	50	50	30	30	150	160	145	160	55	55	420	470	1,000	1,100
Valves and Fittings	3494	1,000	Flat													1,000	1,000	1,000	1,000
Engines and Turbines	3511-19																		
Farm Equipment	352																		
Construction Equipment	3531																		
Mining Equipment	3532	2,000	12.0%	300	400	50	60	80	120	500	600	150	200	420	520	500	600	2,000	2,500
Oil Field Equipment	3533	500	5.0%													500	550	500	550
Industrial Trucks	3537																		
Machine Tools	3541															500	500	500	500
Tools and Dies	3544	500	Flat													260	260	1,000	1,050
Mill Machinery	3547	1,000	2.0%	70	70	85	85	30	30	250	275	275	300	30	30				
Metal Work Machinery	3549																		
Special Industry Machinery	3559	4,000	7.0%	320	360	70	70	200	250	540	650	630	730	40	40	2,200	2,500	4,000	4,600
Pumps	3561																		
Blowers and Fans	3564	500	Flat													500	500	500	500
Power Transmissions	3566																		
Furnaces and Ovens	3567	7,000	2.0%	750	780	530	550	550	570	1,470	1,540	1,190	1,250	270	280	2,240	2,330	7,000	7,300
Motors and Generators	3621																		
Trucks, Buses, Trailers	3713-15																		
Shipbuilding	373																		
Railroad Equipment	3743																		
Tanks (Military)	3795																		
Other		2,000	10.0%	175	200	75	95	100	115	350	370	275	315	75	105	950	1,200	2,000	2,400
Totals		20,500		1,805	2,025	905	955	1,005	1,130	3,380	3,715	2,850	3,150	925	1,065	9,630	10,560	20,500	22,600
Percent of Total Tons		1.8																	

EXHIBIT D

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

PROJECTED 1983 AND 1985 MANGANESE AND WEAR RESISTANT ALLOYS
STEEL CASTING DEMAND BY MARKET SEGMENT AND STATE

Market	SIC	1983 Annual Tons	Compounded Annual Growth 1983-1985	Illinois		Indiana		Michigan		Ohio		Pennsylvania		Wisconsin		Other States Or Unidentified		Total Tons	
				Tons 1983	Tons 1985	Tons 1983	Tons 1985	Tons 1983	Tons 1985	Tons 1983	Tons 1985	Tons 1983	Tons 1985	Tons 1983	Tons 1985	Tons 1983	Tons 1985	Tons 1983	Tons 1985
Municipal and Construction	1611																		
Heating-Nonelectric	3433																		
Boiler Products	3443																		
Valves and Fittings	3494																		
Engines and Turbines	3511-19																		
Farm Equipment	352																		
Construction Equipment	3531	3,000	11.0%	400	490					300	370	200	250	1,100	1,350	1,000	1,240	3,000	3,700
Mining Equipment	3532	10,000	12.0%	120	200	160	200			560	700	300	400	280	400	8,580	10,600	10,000	12,500
Oil Field Equipment	3533																		
Industrial Trucks	3537																		
Machine Tools	3541																		
Tools and Dies	3544																		
Mill Machinery	3547																		
Metal Work: Machinery	3549																		
Special Industry Machinery	3559	2,000	7.0%													2,000	2,300	2,000	2,300
Pumps	3561																		
Blowers and Fans	3564																		
Power Transmissions	3566																		
Furnaces and Ovens	3567																		
Motors and Generators	3621																		
Trucks, Buses, Trailers	3713-15																		
Shipbuilding	373																		
Railroad Equipment	3743	10,000	9.0%													10,000	12,000	10,000	12,000
Tanks (Military)	3795																		
Other		3,000	10.0%	150	170	50	50			250	270	150	160	400	450	2,000	2,500	3,000	3,600
Totals		28,000		670	860	210	250			1,110	1,340	650	810	1,780	2,200	23,580	28,640	28,000	34,100
Percent of Total Tons		2.5																	

EXHIBIT E

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

CARBON STEEL AND LOW ALLOY STEEL DEMAND BY CASTING WEIGHT RANGES - 1985
(Non-Railroad)

Illinois

	Tons of Castings						
Major Markets	Under 100 lbs	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000	Total
Valves and Fittings	[illegible]	468	234	182	208	52	2,600
Engines and Turbines	33	32	65	33	97	390	650
Farm Equipment	435	600	330	120	15	-	1,500
Construction Equipment	23,026	31,760	17,468	6,352	794	-	79,400
Mining Equipment	6,468	1,232	-	-	-	-	7,700
Oil Field Equipment	45	60	30	12	3	-	150
Industrial Trucks	113	12	-	-	-	-	125
Machine Tools	26	3	35	10	15	11	100
Tools and Dies	40	40	10	5	5	-	100
Mill Machinery	450	45	54	81	135	135	900
Pumps	336	132	132	-	-	-	600
Power Transmissions	300	225	150	38	37	-	750
Motors and Generators	-	-	-	-	-	-	-
Trucks, Buses, Trailers	1,440	1,440	320	-	-	-	3,200
Tanks	-	-	-	-	-	-	-
Other	680	906	453	159	45	23	2,266
Total	34,848	36,955	19,281	6,992	1,354	611	100,041

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

CARBON STEEL AND LOW ALLOY STEEL DEMAND BY CASTING WEIGHT RANGES - 1985
(Non-Railroad)

Indiana

	Tons of Castings						
Major Markets	Under 100 lbs	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000	Total
Valves and Fittings	2,679	1,824	627	285	228	57	5,700
Engines and Turbines	140	140	280	140	420	1,680	2,800
Farm Equipment	-	-	-	-	-	-	-
Construction Equipment	2,500	4,000	2,000	1,000	500	-	10,000
Mining Equipment	3,465	4,725	2,310	-	-	-	10,500
Oil Field Equipment	45	60	30	12	3	-	150
Industrial Trucks	-	-	-	-	-	-	-
Machine Tools	-	-	-	-	-	-	-
Tools and Dies	-	-	-	-	-	-	-
Mill Machinery	2,150	215	258	387	645	645	4,300
Pumps	293	312	45	-	-	-	650
Power Transmissions	1,000	-	-	-	-	-	1,000
Motors and Generators	135	36	17	45	97	-	330
Trucks, Buses, Trailers	2,700	-	-	-	-	-	2,700
Tanks	-	-	-	-	-	-	-
Other	264	352	176	62	17	9	880
Total	15,371	11,664	5,743	1,931	1,910	2,391	39,010

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

CARBON STEEL AND LOW ALLOY STEEL DEMAND BY CASTING WEIGHT RANGES - 1985
(Non-Railroad)

Michigan

Major Markets	Tons of Castings						
	Under 100 lbs	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000	Total
Valves and Fittings	470	320	110	50	40	10	1,000
Engines and Turbines	105	105	210	105	315	1,260	2,100
Farm Equipment	-	-	-	-	-	-	-
Construction Equipment	4,760	4,760	2,380	-	-	-	11,900
Mining Equipment	462	644	-	-	294	-	1,400
Oil Field Equipment	-	-	-	-	-	-	-
Industrial Trucks	1,125	125	-	-	-	-	1,250
Machine Tools	104	12	140	40	60	44	400
Tools and Dies	480	480	120	60	60	-	1,200
Mill Machinery	175	18	21	31	53	52	350
Pumps	80	-	-	-	-	-	80
Power Transmissions	-	-	-	-	-	-	-
Motors and Generators	-	-	-	-	-	-	-
Trucks, Buses, Trailers	21,340	20,855	6,305	-	-	-	48,500
Tanks	154	-	187	286	473	-	1,100
Other	482	642	321	112	32	17	1,606
Total	29,737	27,961	9,794	684	1,327	1,383	70,886

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

CARBON STEEL AND LOW ALLOY STEEL DEMAND BY CASTING WEIGHT RANGES - 1985
(Non-Railroad)

Ohio

Major Markets	Tons of Castings: Under 100 lbs	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000	Total
Valves and Fittings	13,338	6,175	2,964	1,235	741	247	24,700
Engines and Turbines	25	25	50	25	75	300	500
Farm Equipment	-	-	-	-	-	-	-
Construction Equipment	14,170	5,886	1,090	654	-	-	21,800
Mining Equipment	5,012	20,764	5,728	4,296	-	-	35,800
Oil Field Equipment	255	340	170	68	17	-	850
Industrial Trucks	113	12	-	-	-	-	125
Machine Tools	182	21	245	70	105	77	700
Tools and Dies	400	400	100	50	50	-	1,000
Mill Machinery	3,360	840	980	3,640	3,360	1,820	14,000
Pumps	2,016	416	672	96	-	-	3,200
Power Transmissions	-	-	-	-	-	-	-
Motors and Generators	330	91	42	115	248	-	825
Trucks, Buses, Trailers	19,200	9,000	1,500	300	-	-	30,000
Tanks	308	-	374	572	946	-	2,200
Other	941	1,254	627	219	63	31	3,135
Total	59,650	45,224	14,541	11,340	5,605	2,475	138,835

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

CARBON STEEL AND LOW ALLOY STEEL DEMAND BY CASTING WEIGHT RANGES - 1985
(Non-Railroad)

Pennsylvania

Major Markets	Tons of Castings						
	Under 100 lbs	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000	Total
Valves and Fittings	7,991	2,751	655	786	524	393	13,100
Engines and Turbines	190	190	380	190	570	2,280	3,800
Farm Equipment	-	-	-	-	-	-	-
Construction Equipment	2,640	8,580	1,980	-	-	-	13,200
Mining Equipment	10,638	6,304	2,758	-	-	-	19,700
Oil Field Equipment	660	880	440	176	44	-	2,200
Industrial Trucks	562	63	-	-	-	-	625
Machine Tools	-	-	-	-	-	-	-
Tools and Dies	160	160	40	20	20	-	400
Mill Machinery	5,643	297	297	693	891	2,079	9,900
Pumps	810	1,566	2,754	270	-	-	5,400
Power Transmissions	100	75	50	13	12	-	250
Motors and Generators	220	61	27	77	165	-	550
Trucks, Buses, Trailers	2,100	-	-	-	-	-	2,100
Tanks	308	-	374	572	946	-	2,200
Other	512	682	341	119	34	17	1,705
Total	32,534	21,609	10,096	2,916	3,206	4,769	75,130

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

CARBON STEEL AND LOW ALLOY STEEL DEMAND BY CASTING WEIGHT RANGES - 1985
(Non-Railroad)

Wisconsin

Major Markets	Tons of Castings						
	Under 100 lbs	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000	Total
Valves and Fittings	1,750	875	560	210	105	-	3,500
Engines and Turbines	20	20	40	20	60	240	400
Farm Equipment	145	200	110	40	5	-	500
Construction Equipment	5,940	9,207	6,237	6,237	2,079	-	29,700
Mining Equipment	3,330	7,585	2,960	2,035	1,295	1,295	18,500
Oil Field Equipment	45	60	30	12	3	-	150
Industrial Trucks	-	-	-	-	-	-	-
Machine Tools	78	9	105	30	45	33	300
Tools and Dies	-	-	-	-	-	-	-
Mill Machinery	275	28	33	50	82	82	550
Pumps	70	-	-	--	-	-	-
Power Transmissions	300	225	150	38	37	-	750
Motors and Generators	330	91	41	116	247	-	825
Trucks, Buses, Trailers	2,475	2,475	550	-	-	-	5,500
Tanks	-	-	-	--	-	-	-
Other	422	563	282	99	28	14	1,408
Total	15,180	21,338	11,098	8,887	3,986	1,664	62,153

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

CORROSION RESISTANT STEEL DEMAND BY CASTING WEIGHT RANGES - 1985
(Non-Railroad)

Illinois

Major Markets	Tons of Castings						
	Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000	Total
Valves and Fittings	432	234	117	45	45	27	900
Special Industry Machines	95	30	16	12	14	3	170
Pumps	112	144	144	-	-	-	400
Other	48	48	31	16	9	8	160
Total	687	456	308	73	68	38	1,630

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

CORROSION RESISTANT STEEL DEMAND BY CASTING WEIGHT RANGES - 1985
(Non-Railroad)

Indiana

Major Markets	Tons of Castings						
	Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000	Total
Valves and Fittings	620	130	130	40	40	40	1,000
Special Industry Machines	119	25	25	8	7	6	190
Pumps	139	122	29	-	-	-	290
Other	48	47	32	16	9	8	160
Total	926	324	216	64	56	54	1,640

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

CORROSION RESISTANT STEEL DEMAND BY CASTING WEIGHT RANGES - 1985
(Non-Railroad)

Michigan

Major Markets	Tons of Castings						
	Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000	Total
Valves and Fittings	186	39	39	12	12	12	300
Special Industry Machines	60	-	-	-	-	-	60
Pumps	60	-	-	-	-	-	60
Other	22	11	7	5	3	2	50
Total	328	50	46	17	15	14	470

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

CORROSION RESISTANT STEEL DEMAND BY CASTING WEIGHT RANGES - 1985
(Non-Railroad)

Ohio

Major Markets	Tons of Castings: Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000	Total
Valves and Fittings	5,704	2,116	828	276	184	92	9,200
Special Industry Machines	1,085	402	158	52	35	18	1,750
Pumps	72	390	138	-	-	-	600
Other	374	374	251	128	62	61	171
Total	7,235	3,282	1,375	456	281	171	12,800

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

CORROSION RESISTANT STEEL DEMAND BY CASTING WEIGHT RANGES - 1985
(Non-Railroad)

Pennsylvania

	Tons of Castings						
Major Markets	Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000	Total
Valves and Fittings	2,714	1,150	414	138	92	92	4,600
Special Industry Machines	515	218	79	26	18	17	873
Pumps	380	620	560	340	80	20	2,000
Other	248	248	165	83	42	41	827
Total	3,857	2,236	1,218	587	232	170	8,300

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

CORROSION RESISTANT STEEL DEMAND BY CASTING WEIGHT RANGES - 1985
(Non-Railroad)

Wisconsin

Major Markets	Tons of Castings: Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000	Total
Valves and Fittings	308	280	63	21	14	14	700
Special Industry Machines	59	50	12	4	3	2	130
Pumps	50	-	-	-	-	-	50
Other	28	20	14	9	5	4	80
Total	445	350	89	34	22	20	960

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

HEAT RESISTANT STEEL DEMAND BY CASTING WEIGHT RANGES - 1985
(Non-Railroad)

Illinois

Major Markets	Tons of Castings: Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000	Total
Heating-Nonelectric	32	8	-	-	-	-	40
Boiler Products	140	35	-	-	-	-	175
Mining Equipment	320	80	-	-	-	-	400
Mill Machinery	56	14	-	-	-	-	70
Special Industry Machines	252	108	-	-	-	-	360
Furnaces and Ovens	624	156	-	-	-	-	780
Other	100	60	20	20	-	-	200
Total	1,524	461	20	20	-	-	2,025

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

HEAT RESISTANT STEEL DEMAND BY CASTING WEIGHT RANGES - 1985
(Non-Railroad)

Indiana

Major Markets	Tons of Castings						
	Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000	Total
Heating-Nonelectric	36	9	-	-	-	-	45
Boiler Products	40	10	-	-	-	-	50
Mining Equipment	48	12	-	-	-	-	60
Mill Machinery	68	17	-	-	-	-	85
Special Industry Machines	49	21	-	-	-	-	70
Furnaces and Ovens	440	110	-	-	-	-	550
Other	48	28	10	9	-	-	95
Total	729	207	10	9	-	-	955

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

HEAT RESISTANT STEEL DEMAND BY CASTING WEIGHT RANGES - 1985
(Non-Railroad)

Michigan

Major Markets	Tons of Castings: Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000	Total
Heating-Nonelectric	2	3	-	-	-	-	15
Boiler Products	24	6	-	-	-	-	30
Mining Equipment	96	24	-	-	-	-	120
Mill Machinery	24	6	-	-	-	-	30
Special Industry Machines	175	75	-	-	-	-	250
Furnaces and Ovens	456	114	-	-	-	-	570
Other	58	38	12	11	-	-	115
Total	845	262	12	11	-	-	1,130

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

HEAT RESISTANT STEEL DEMAND BY CASTING WEIGHT RANGES - 1985
(Non-Railroad)

Ohio

Major Markets	Tons of Castings						
	Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000	Total
Heating-Nonelectric	96	24	-	-	-	-	120
Boiler Products	120	40	-	-	-	-	160
Mining Equipment	480	120	-	-	-	-	600
Mill Machinery	220	55	-	-	-	-	275
Special Industry Machines	455	195	-	-	-	-	650
Furnaces and Ovens	1,232	308	-	-	-	-	1,540
Other	185	111	37	37	-	-	370
Total	2,788	853	37	37	-	-	3,715

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

HEAT RESISTANT STEEL DEMAND BY CASTING WEIGHT RANGES - 1985
(Non-Railroad)

Pennsylvania

Major Markets	Tons of Castings: Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000	Total
Heating-Nonelectric	156	39	-	-	-	-	195
Boiler Products	128	32	-	-	-	-	160
Mining Equipment	160	40	-	-	-	-	200
Mill Machinery	240	60	-	-	-	-	300
Special Industry Machines	511	219	-	-	-	-	730
Furnaces and Ovens	1,000	250	-	-	-	-	1,250
Other	157	95	32	31	-	-	315
Total	2,352	735	32	31	-	-	3,150

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

HEAT RESISTANT STEEL DEMAND BY CASTING WEIGHT RANGES - 1985
(Non-Railroad)

Wisconsin

	Tons of Castings						
Major Markets	Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000	Total
Heating-Nonelectric	28	7	-	-	-	-	35
Boiler Products	44	11	-	-	-	-	55
Mining Equipment	416	104	-	-	-	-	520
Mill Machinery	24	6	-	-	-	-	30
Special Industry Machines	28	12	-	-	-	-	40
Furnaces and Ovens	224	56	-	-	-	-	280
Other	53	32	10	10	-	-	105
Total	817	228	10	10	-	-	1,065

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

MANGANESE STEEL DEMAND BY CASTING WEIGHT RANGES - 1985
(Non-Railroad)

Illinois

Major Markets	Tons of Steel Castings						
	Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000	Total
Construction Equipment	64	299	127	-	-	-	490
Mining Equipment	26	122	52	-	-	-	200
Other	51	49	35	18	17	-	170
Total	141	470	214	18	17	-	860

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

MANGANESE STEEL DEMAND BY CASTING WEIGHT RANGES - 1985
(Non-Railroad)

Indiana

Major Markets	Tons of Steel Castings						
	Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000	Total
Construction Equipment	-	-	-	-	-	-	-
Mining Equipment	26	122	52	-	-	-	200
Other	15	15	10	5	5	-	50
Total	41	137	62	5	5	-	250

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

MANGANESE STEEL DEMAND BY CASTING WEIGHT RANGES - 1985
(Non-Railroad)

Ohio

Major Markets	Tons of Steel Castings						
	Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000	Total
Construction Equipment	48	226	96	-	-	-	370
Mining Equipment	91	427	182	-	-	-	700
Other	81	81	54	27	27	-	270
Total	220	734	332	27	27	-	1,340

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

MANGANESE STEEL DEMAND BY CASTING WEIGHT RANGES - 1985
(Non-Railroad)

Pennsylvania

	Tons of Steel Castings						
Major Markets	Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000	Total
Construction Equipment	33	152	65	-	-	-	250
Mining Equipment	52	224	104	-	-	-	400
Other	48	46	33	17	16	-	160
Total	133	442	202	17	16	-	810

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

MANGANESE STEEL DEMAND BY CASTING WEIGHT RANGES - 1985
(Non-Railroad)

Wisconsin

	Tons of Steel Castings						
Major Markets	Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000	Total
Construction Equipment	810	405	135	-	-	-	1,350
Mining Equipment	240	120	40	-	-	-	400
Other	138	135	88	45	44	-	450
Total	1,188	660	263	45	44	-	2,200

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

GENERAL STATUS OF CARBON STEEL CASTINGS MARKET BY WEIGHT RANGE - 1985
(Non-Railroad)

States	(000) Tons of Castings Demand						
	Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000	Total
Illinois	34.7	37.0	19.2	7.1	1.4	0.6	100.0
Indiana	15.3	11.7	5.7	2.0	1.9	2.4	39.0
Michigan	29.7	28.0	9.8	0.7	1.3	1.4	70.9
Ohio	59.7	45.2	14.5	11.3	5.6	2.5	138.8
Pennsylvania	32.5	21.6	10.1	2.9	3.2	4.8	75.1
Wisconsin	15.2	21.3	11.1	8.9	4.0	1.7	62.2
Six-State Total	187.1	164.8	70.4	32.9	17.4	13.4	486.0
Demand/Supply Ratio	.88	.90	.90	.95	1.05	1.10	
Average 1983 Selling Price/Pound	$1.10	$1.00	$0.95	$0.90	$0.90	$0.88	
Average 1983 Productivity Rate in Man-Hours per Ton	50	45	55	55	60	70	
Average 1983 Hourly Labor Rate Including Fringes	$11.80	$ ..70	$11.50	$11.40	$11.20	$11.00	
Projected 1985 Import Tons (000)	45.0	39.0	17.0	8.0	4.0	3.0	

Note: All data relative to the subject six-state region.

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

GENERAL STATUS OF CORROSION RESISTANT STEEL CASTINGS MARKET
BY WEIGHT RANGE - 1985
(Non-Railroad)

States	(000) Tons of Castings Demand						
	Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000	Total
Illinois	0.69	0.46	0.31	0.07	0.07	0.04	1.64
Indiana	0.92	0.33	0.22	0.06	0.06	0.05	1.64
Michigan	0.31	0.05	0.05	0.02	0.02	0.01	0.46
Ohio	7.23	3.28	1.37	0.45	0.28	0.17	12.78
Pennsylvania	3.86	2.24	1.22	0.58	0.23	0.17	8.30
Wisconsin	0.45	0.36	0.10	0.03	0.02	0.02	0.98
Six-State Total	13.46	6.72	3.27	1.21	0.68	0.46	25.80
Demand/Supply Ratio	.90	.93	.96	1.00	1.05	1.10	
Average 1983 Selling Price/Pound	$3.70	$3.50	$3.30	$3.20	$3.20	$3.20	
Average 1983 Productivity Rate in Man-Hours per Ton	150	140	140	150	150	170	
Average 1983 Hourly Labor Rate Including Fringes	$11.80	$11.70	$11.50	$11.40	$11.20	$11.00	
Projected 1985 Import Tons (000)	2.8	1.4	0.7	0.3	0.1	0.1	

Note: All data relative to the subject six-state region.

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

GENERAL STATUS OF HEAT RESISTANT STEEL CASTINGS MARKET
BY WEIGHT RANGE - 1985
(Non-Railroad)

	(000) Tons of Castings Demand						
States	Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000	Total
Illinois	1.53	0.46	0.02	0.02	-	-	2.03
Indiana	0.73	0.21	0.01	0.01	-	-	0.96
Michigan	0.84	0.26	0.01	0.01	-	-	1.12
Ohio	2.79	0.85	0.04	0.04	-	-	3.72
Pennsylvania	2.35	0.74	0.03	0.03	-	-	3.15
Wisconsin	0.82	0.23	0.01	0.01	-	-	1.07
Six-State Total	9.06	2.75	0.12	0.12	-	-	12.05
Demand/Supply Ratio	.95	.95	.95	.95	-	-	
Average 1983 Selling Price/Pound	$2.90	$2.80	$2.80	$2.70	-	-	
Average 1983 Productivity Rate in Man-Hours per Ton	140	120	120	130	-	-	
Average 1983 Hourly Labor Rate Including Fringes	$11.80	$11.70	$11.50	$11.40	$11.20	$11.00	
Projected 1985 Import Tons (000)	1.8	0.4	-	-	-	-	

Note: All data relative to the subject six-state region. Captive supply of Heat Resistant steel castings in this region is negligible.

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

GENERAL STATUS OF MANGANESE STEEL CASTINGS MARKET
BY WEIGHT RANGE - 1985
(Non-Railroad)

States	(000) Tons of Castings Demand						
	Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000	Total
Illinois	0.14	0.47	0.21	0.02	0.02	-	0.86
Indiana	0.04	0.14	0.05	0.01	0.01	-	0.25
Michigan	-	-	-	-	-	-	-
Ohio	0.22	0.73	0.33	0.03	0.03	-	1.34
Pennsylvania	0.13	0.45	0.20	0.02	0.01	-	0.81
Wisconsin	1.18	0.66	0.26	0.05	0.04	-	2.19
Six-State Total	1.71	2.45	1.05	0.13	0.11	-	5.45
Demand/Supply Ratio	.95	.95	1.00	1.00	1.00		
Average 1983 Selling Price/Pound	$2.40	$2.30	$2.15	NA	NA		
Average 1983 Productivity Rate in Man-Hours per Ton	120	110	110	NA	NA		
Average 1983 Hourly Labor Rate Including Fringes	$11.80	$11.70	$11.50	$11.40	$11.20	$11.00	
Projected 1985 Import Tons (000)	-	-	-	-	-	-	

Note: All data relative to the subject six-state region.

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

VALVES AND FITTINGS MARKET

STEEL CASTING SIZE-WEIGHT DISTRIBUTION BY WEIGHT RANGE

	Percent of Tons by State					
Carbon and Low Alloy	Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000
Illinois	56	18	9	7	8	2
Indiana	47	32	11	5	4	1
Michigan	47	32	11	5	4	1
Ohio	54	25	12	5	3	1
Pennsylvania	61	21	5	6	4	3
Wisconsin	50	25	16	6	3	-
Other	59	23	9	4	3	2
Corrosion Resistant						
Illinois	48	26	13	5	5	3
Indiana	62	13	13	4	4	4
Michigan	62	13	13	4	4	4
Ohio	62	23	9	3	2	1
Pennsylvania	59	25	9	3	2	2
Wisconsin	44	40	9	3	2	2
Other	69	20	7	2	1	1

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, ANADA

CONSTRUCTION EQUIPMENT MARKET

STEEL CASTING SIZE-WEIGHT DISTRIBUTION BY WEIGHT RANGE

	Percent of Tons by State					
Carbon and Low Alloy	Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000
Illinois	29	40	22	8	1	-
Indiana	25	40	20	10	5	-
Michigan	40	40	20	-	-	-
Ohio	65	27	5	3	-	-
Pennsylvania	20	65	15	-	-	-
Wisconsin	20	31	21	21	7	-
Other	25	45	10	13	6	1
Manganese						
Illinois	13	61	26	-	-	-
Indiana	13	61	26	-	-	-
Michigan						
Ohio	13	61	26	-	-	-
Pennsylvania	13	61	26	-	-	-
Wisconsin	60	30	10	-	-	-
Other	30	30	20	10	10	-

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

MINING EQUIPMENT MARKET

STEEL CASTING SIZE-WEIGHT DISTRIBUTION BY WEIGHT RANGE

	Percent of Tons by State					
Carbon and Low Alloy	Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000
Illinois	84	16	-	-	-	-
Indiana	33	45	22	-	-	-
Michigan	33	46	-	-	21	-
Ohio	14	58	16	12	-	-
Pennsylvania	54	32	14	-	-	-
Wisconsin	18	41	16	11	7	7
Other	55	33	12	-	-	-

Manganese

Approximately 90% of tonnage sold directly to user as spare parts.

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

MILL MACHINERY MARKET

STEEL CASTING SIZE-WEIGHT DISTRIBUTION BY WEIGHT RANGE

	Percent of Tons by State					
Carbon and Low Alloy	Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000
Illinois	50	5	6	9	15	15
Indiana	50	5	6	9	15	15
Michigan	Unidentified					
Ohio	24	6	7	26	24	13
Pennsylvania	57	3	3	7	9	21
Wisconsin	50	5	6	9	15	15
Other	Unidentified					

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

PUMP MARKET

STEEL CASTING SIZE-WEIGHT DISTRIBUTION BY WEIGHT RANGE

	Percent of Tons by State					
Carbon and Low Alloy	Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000
Illinois	56	22	22	-	-	-
Indiana	45	48	7	-	-	-
Michigan	100	-	-	-	-	-
Ohio	63	13	21	3	-	-
Pennsylvania	15	29	51	5	-	-
Wisconsin	100	-	-	-	-	-
Other	21	23	21	18	13	4
Corrosion Resistant						
Illinois	28	36	36	-	-	-
Indiana	48	42	10	-	-	-
Michigan	100	-	-	-	-	-
Ohio	12	65	23	-	-	-
Pennsylvania	19	31	28	17	4	1
Wisconsin	100	-	-	-	-	-
Other	25	24	21	22	7	1

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

TRUCK, BUS, AND TRAILER MARKET

STEEL CASTING SIZE-WEIGHT DISTRIBUTION BY WEIGHT RANGE

	Percent of Tons by State					
Carbon and Low Alloy	Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000
Illinois	45	45	10	-	-	-
Indiana	100	-	-	-	-	-
Michigan	44	43	13	-	-	-
Ohio	64	30	5	1	-	-
Pennsylvania	100	-	-	-	-	-
Wisconsin	45	45	10	-	-	-
Other	49	51	-	-	-	-

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

MISCELLANEOUS MARKET SEGMENTS

CARBON AND LOW ALLOY STEEL CASTING SIZE-WEIGHT DISTRIBUTION

Miscellaneous Market Segments	Percent of Tons by Market					
	Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000
Power Transmissions and Speed Changers	40	30	20	5	5	-
Motors and Generators	40	11	5	14	30	-
Engines and Turbines	5	5	10	5	15	60
Metal Working Machinery and Special Tools and Dies	26	3	35	10	15	11
Industrial Trucks	90	10	-	-	-	-
Tanks (Military)	14	-	17	26	43	-
Farm Equipment	29	40	22	8	1	-
Oil Field Equipment	30	40	20	8	2	-
Tools and Dies	40	40	10	5	5	-
Other Carbon Steel	30	40	20	7	2	1
Other Corrosion Resistant	30	30	20	10	5	5

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

HEAT RESISTANT ALLOYS

STEEL CASTING SIZE-WEIGHT DISTRIBUTION BY WEIGHT RANGES

Miscellaneous Market Segments	Percent of Tons by Market					
	Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000
Industrial Furnaces and Other Miscellaneous Castings	80	20	-	-	-	-
Reformer and Ethylene Tube Bends and "Y"s	70	30	-	-	-	-
Other	50	30	10	10	-	-

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

TOTAL PROJECTED DEMAND, CAPTIVE PRODUCTION, IMPORTS, AND NET AVAILABLE MARKET FOR CARBON AND LOW ALLOY STEEL CASTINGS IN 1985

(000 Tons)

Market Segment	Demand	Captive Supply	Imports	Net Available Market
Valves and Fittings	50.60	2.00	20.20	48.60
Engines and Turbines	10.25	-	3.10	10.25
Farm Equipment	2.00	-	-	2.00
Construction Equipment	166.00	16.00	49.80	150.00
Mining Equipment	93.60	8.00	18.70	85.60
Oil Field Equipment	3.50	-	1.00	3.50
Industrial Trucks	2.12	-	0.30	2.12
Machine Tools	1.50	-	-	1.50
Tools and Dies	2.70	-	-	2.70
Mill Machinery	30.00	8.00	0.40	22.00
Pumps	10.00	2.00	2.00	8.00
Power Transmissions	2.75	0.50	-	2.25
Trucks, Buses, Trailers	92.00	8.00	18.40	84.00
Motors and Generators	2.53	-	-	2.53
Tanks	5.50	-	-	5.50
Other	11.00	1.00	2.20	10.00
Total	496.05	45.5	116.10	440.55

Note: All data relative to the subject six-state region.

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

TOTAL PROJECTED DEMAND, CAPTIVE PRODUCTION, IMPORTS, AND NET AVAILABLE MARKET FOR CORROSION RESISTANT STEEL CASTINGS IN 1985

(000 Tons)

Market Segment	Demand	Captive Supply	Imports	Net Available Market
Valves and Fittings	16.7	2.2	3.3	14.5
Special Industry Machinery	3.2	-	0.8	3.2
Pumps	3.4	0.8	0.8	2.6
Other	2.5	-.	0.5	2.5
Total	25.8	3.0	5.4	22.8

HEAT RESISTANT STEEL CASTINGS IN 1985

(000)

Market Segment	Demand	Captive Supply	Imports	Net Available Market
Special Industry	.7	-	.2	0.7
Furnace and Ovens	1.25	-	.2	1.25
Others	1.2	-	.1	1.2
	3.15		.5	3.15

* Static cast only.

Note: All data relative to the subject six-state region.

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

TOTAL PROJECTED DEMAND, CAPTIVE PRODUCTION, IMPORTS, AND NET AVAILABLE MARKET FOR MANGANESE STEEL CASTINGS IN 1985

(000 Tons)

Market Segment	Demand	Captive Supply	Imports	Net Available Market
Construction Equipment	2.5	0.5	-	2.0
Mining Equipment	1.9	0.3	-	1.6
Other	1.1	0.1	-	1.0
Total	5.5	0.9	-	4.6

Note: All data relative to the subject six-state region.

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

PROJECTED 1985 DEMAND, SUPPLY, AND IMPORT CONDITIONS
IN THE SIX-STATE REGION FOR
CARBON AND LOW ALLOY STEEL CASTINGS
(000 Tons)

Casting Wgt. Range (lbs.)	Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000	Total
Regional Demand	187	165	70	33	18	13	486
Regional Supply	213	183	78	35	17	12	538
Excess or (Shortage) of Supply	26	18	8	2	(1)	(1)	52
Projected Imports	45	39	17	8	4	3	116

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

PROJECTED 1985 DEMAND, SUPPLY, AND IMPORT CONDITIONS
IN THE SIX-STATE REGION FOR
CORROSION RESISTANT STEEL CASTINGS
(000 Tons)

Casting Wgt. Range (lbs.)	Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000	Total
Regional Demand	13.50	6.70	3.30	1.20	0.70	0.50	25.90
Regional Supply	15.00	7.20	3.40	1.20	0.66	0.45	27.91
Excess or (Shortage) of Supply	1.50	0.50	0.10	-	(0.04)	(0.05)	2.01
Projected Imports	2.80	1.40	0.70	0.30	0.10	0.10	5.40

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

PROJECTED 1985 DEMAND, SUPPLY, AND IMPORT CONDITIONS
IN THE SIX-STATE REGION FOR
HEAT RESISTANT STEEL CASTINGS
(000 Tons)

Casting Wgt. Range (lbs.)	Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000	Total
Regional Demand	9.1	2.7	0.1	0.1	-	-	12.0
Regional Supply	9.6	2.8	0.1	0.1	-	-	12.6
Excess or (Shortage) of Supply	0.5	0.1	-	-	-	-	0.6
Projected Imports	1.8	0.4	-	-	-	-	2.2

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

PROJECTED 1985 DEMAND, SUPPLY, AND IMPORT CONDITIONS
IN THE SIX-STATE REGION FOR
MANGANESE STEEL CASTINGS
(000 Tons)

Casting Wgt. Range (lbs.)	Under 100	101 to 500	501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000	Total
Regional Demand	1.7	2.4	1.1	0.1	0.1	-	5.4
Regional Supply	1.8	2.5	1.2	0.1	0.1	-	5.7
Excess or (Shortage) of Supply	0.1	0.1	0.1	-	-	-	0.3
Projected Imports	-	-	-	-	-	-	-

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

MAJOR VALVE MANUFACTURERS IN THE UNITED STATES

PROJECTED 1983 CONSUMPTION OF CARBON AND LOW ALLOY STEEL CASTINGS

BY FOUNDING PROCESS (TONS)

Casting Weight Range in Pounds	Under 100		101 to 500		501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000	
Molding Process	Sand	Shell	Sand	Shell	Sand	Sand	Sand	Sand	Plant Locations
Rockwell International	740	370	350	150	185	85	60	75	Carpentersville, IL; Raleigh, NC; Sulphur Springs, TX
Henry Pratt Co.	220	80	70	45	75	75	100		Aurora, IL
Conval, Inc.	740	300	1,100	75	370	150	150	75	Hammond, IN; Cincinnati, OH
Henry Vogt Machine Co., Inc.	590	300	210	150	150	75	45		Louisville, KY
Xomox	520	220	150	110	75	30	20		Cincinnati, OH
William Powell Co.	1,920	590	700	150	515	260	125		Cincinnati, OH
Dresser Industries	740	370	300	150	185	85	50	50	Anniston, AL; Stratford, CT; Alexandria, LA; Wellsboro, PA
Durkon Co. Inc.	740	370	300	150	185	75	35		Dayton, OH; Warminster, PA; Cookville, TN
Walworth	740	300	290	150	150	110	60	60	Canton, MA; Linden, NJ; Greensburg, PA; King of Prussia, PA
Leslie Co.	370	150	80	75					Parsippany, NJ
ITT	300	80	70	45	75	75	100	75	Chicago, IL; Indianapolis, IN; Amory, MS; Chatsworth, CA
Tufline (Xomox)	740	300	300	150	185	150	100	60	Cincinnati, OH
Pittsburg Brass Mfg. Co.	220								Irwin, PA
American Meter	220								Philadelphia, PA
Crane Co.	520	150	300	75	185	75	75	75	Chicago, IL; Indian Orchard, MA; Washington, IA; Warrington, PA
Jenkins Brothers	590	300	200	45	150	75	45		Bridgeport, CT
Jamesbury Corp.	1,650	750	700	300	430	150	75		Worcester, MA
Crosby Valve & Gage Co.	520	150	180	75	75	75	35		Wrentham, MA
Ladish Co.	1,480	370	750	150	590	220	110		Kenosha, WI; Cudahy, WI; Cynthiana, KY
Fisher Controls International	1,460	590	350	220					Sherman, TX; McKinney, TX; Caraopolis, PA; Marshalltown, IA
Brighton Corporation	220		70		75	30			Cincinnati, OH
Posi-Seal International Inc.	1,650	740	590	370	370	110	50		North Stonington, CT
Pacific Valve - Mark Controls	740	370	300	150	185	75	75	75	Long Beach, CA; Evanston, IL; Lake Zurich, IL; Tulsa, OK
Watts Regulator Co. Inc.	720	220	300	75					Franklin, NH
Peabody Dore Corp.	220	80	70	45					Houston, TX
Taylor Oil Tools Inc.	220								Oklahoma City, OK
Bailey-Hoogovens USA	220								Washington, PA
Stockham Valves & Fittings Co.	750	80	350	45	185	75	35		Birmingham, AL
Atwood-Morrill			70		220	295	255	220	Salem, MA; Washington, NC
Nibco	740	370	350	150	185	150	100	75	Augusta, AR; Stytheville, AR; Dayton, OH
Miscellaneous Other	6,200	4,900	1,800	2,800	2,600	1,200	500	660	
Process Totals	26,580	12,500	10,300	5,900	7,400	3,700	2,200	1,500	
Size Range Totals	39,080		16,200		7,400	3,700	2,200	1,500	

EXHIBIT P
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DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

MAJOR VALVE MANUFACTURERS IN THE UNITED STATES
PROJECTED 1983 CONSUMPTION OF CORROSION RESISTANT STEEL CASTINGS
BY FOUNDING PROCESS (TONS)

Casting Weight Range in Pounds	Under 100		101 to 500		501 to 1,000	1,001 to 5,000	5,001 to 10,000	Over 10,000
Molding Process	Sand	Shell –	Sand	Shell	Sand	Sand	Sand	Sand
Rockwell International	230	60	60	30	60	30	30	10
Henry Pratt Co.	60	10	60	10	30	10	10	10
Conval, Inc.	230	60	110		110	30	30	30
Henry Vogt Machine Co., Inc.	100							
Xomox	620	280	110	90	60	20	10	
William Powell Co.	620	110	110	110	110	30	10	10
Dresser Industries	230	110	170	60	110	30	20	10
Duriron Co. Inc.	280	60	110	30	30	20	20	10
Walworth	230	60	110	30	60			
Leslie Co.	60	60						
ITT	60	60	60	30	30	20	10	10
Tufline (Xomox)	280	60	110	30	30	30	20	10
Pittsburg Brass Mfg. Co.	60							
American Meter	60							
Crane Co.	100	30	60	30	30	20	20	20
Jenkins Brothers	230	60	60		60	10		
Jamesbury Corp.	1,020	280	170	90	60	10	10	
Crosby Valve & Gage Co.	110	30	60	30	60			
Ladish Co.	230	60	110	60	60	20	10	10
Fisher Controls International	170							
Brighton Corporation	60	60						
Posi-Seal International Inc.	340	230	110	60	60	10	10	
Pacific Valve - Mark Controls	170	60	110	60	60	20	10	10
Watts Regulator Co. Inc.	170	60	110	30				
Peabody Dore Corp.	60	60						
Taylor Oil Tools Inc.	60							
Bailey-Hoogovens USA	60							
Stockham Valves & Fittings Co.	170	60	110	30				
Atwood-Morrill					30	20	20	20
Worcester Controls Corp.	170							
Miscellaneous Other	1,260	1,330	590	440	300	170	160	90
Process Totals	7,500	3,250	2,500	1,250	1,350	500	400	250
Size Range Totals	10,750		3,750		1,350	500	400	250

Plant Locations
Carpentersville, IL; Raleigh, NC; Sulphur Springs, TX
Aurora, IL
Hammond, IN; Cincinnati, OH
Louisville, KY
Cincinnati, OH
Cincinnati, OH
Anniston, AL; Stratford, CT; Alexandria, LA; Wellsboro, PA
Dayton, OH; Warminster, PA; Cookville, TN
Canton, MA; Linden, NJ; Greensburg, PA; King of Prussia, PA
Parsippany, NJ
Chicago, IL; Indianapolis, IN; Amory, MS; Chatsworth, CA
Cincinnati, OH
Irwin, PA
Philadelphia, PA
Chicago, IL; Indian Orchard, MA; Washington, IA; Warrington, PA
Bridgeport, CT
Worcester, MA
Wrentham, MA
Kenosha, WI; Cudahy, WI; Cynthiana, KY
Sherman, TX; McKinney, TX; Corsopolis, PA; Marshalltown, IA
Cincinnati, OH
North Stonington, CT
Long Beach, CA; Evanston, IL; Lake Zurich, IL; Tulsa, OK
Franklin, NH
Houston, TX
Oklahoma City, OK
Washington, PA
Birmingham, AL
Salem, MA; Washington, NC
West Boylston, MA; Olive Branch, MS

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EXHIBIT R

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

PROJECTED STEEL INVESTMENT CASTING DEMAND FOR THE VALVE AND FITTING MARKET

State	1983 Demand Tons		1985 Demand Tons	
	Carbon Steel	Corrosion Resistant	Carbon Steel	Corrosion Resistant
Illinois	360	220	600	300
Indiana	450	80	750	100
Michigan	120	50	200	70
Ohio	3,600	3,800	6,000	5,350
Pennsylvania	1,980	1,700	3,300	2,400
Wisconsin	300	200	500	280
Other States	5,190	4,950	8,650	7,000
Total	12,000	11,000	20,000	15,500

Note: These investment casting tonnages are not included in the statistics used in other sections of this report.

DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

MAJOR COMPETITIVE U.S. STEEL FOUNDRIES
(Six-State Region)

Foundry	Captive Or Jobbing	Number of Plants	Capacity Annual Net Good Tons	Major Markets Served						Alloys Produced				Productivity Level Man-Hours/Ton
				Mining	Railroad	Construction Equipment	Pumps & Valves	Truck	Other	Corrosion Resistant	Carbon & Low Alloy	Heat Resistant	Other	
Illinois														
Calumet	J	1	2,000			1,000			1,000	X	X			150
Columbia	J	1	8,000						8,000		X		X Man-Aus.	55
Electrocast	J	1	3,000			2,000		1,000			X			90
Galtre	J	1	2,000						2,000		X			50
Gunite	J	1	60,000			25,000	5,000	15,000	15,000		X			35
Midland Ross	J	2	75,000		35,000	20,000		15,000	5,000		X			30 to 50
Sterling Steel	J	1	6,000			2,000	2,000	2,000			X			30 to 35
Alloy Engineering	J	1	2,000				1,500		500	X		X		60 to 70
Universal Electric	J	1	300						300	X		X	X Man	Not Available
Indiana														
American Steel Foundries	J	1	25,000		20,000			5,000			X			40 to 60
Electric Steel Foundry	J	1	5,500		1,000	1,500	1,500		1,000		X			65
Harrison Steel Foundry	J	1	31,000		5,000	10,000	1,000	1,000	14,000		X			75
Slaw-Knox	J	1	43,000			20,000			23,000		X			50
Dayton-Walther	J	1	18,000					15,000	3,000		X			35 to 40
Abex	J	1	12,000	3,000	2,000	3,000			8,000				X Man-Aus.	Not Available
Michigan														
AM Holst Bay City	C	1	5,000			5,000					X			50
Mid Ross Bay City	90J-10C	1	10,000			4,000	1,000		5,000	X	X	X	X Man-Aus.	45
Berve Enterprises	J	1	3,000		1,000			1,000	1,000	X	X	X	X Man-Aus.	Not Available
Delray Steel Castings	J	1	6,000			3,000	1,000		2,000	X	X			Not Available
Huron Casting Inc.	J	1	6,000			2,000		1,000	3,000		X		X Man	60
Reelsta-Loy Co. Inc.	J	1	1,800						1,800	X		X	X Man	75
Tech-Cast	J	1	4,800		1,000			3,000	800		X			55
Westren Corp.	J	1	15,000	2,000		4,000	4,000	4,000	1,000	X	X	X	X Man-Aus.	70
Ohio														
Abex	J	1	7,000	3,000			2,000		2,000	X		X		Not Available
Advance	J	1	4,800			2,800			2,000		X			Not Available
Alloy Cast Steel Co.	J	1	3,000	1,000		1,000			1,000		X		X Man-Aus.	70
American Steel Foundries	J	1	65,000		60,000				5,000		X			40 to 60
Atlantic Foundry Co.	J	1	14,000	2,000	7,000	3,000			2,000		X			84
Babcox Wilcox	60J-40C	1	1,800						1,800	X	X	X		Not Available
Buckeye Steel	J	1	80,000		75,000			2,000	3,000		X			50 to 55
Cleveland Alloy Castings	J	1	2,100						2,100	X		X		90
Columbiana	J	1	6,000	2,000					4,000	X	X	X		60 to 65

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DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

MAJOR COMPETITIVE U.S. STEEL FOUNDRIES
(Six-State Region)

Foundry	Captive Or Jobbing	Number of Plants	Capacity Annual Net Good Tons	Major Markets Served						Alloys Produced				Productivity Level Man-Hours/Ton
				Mining	Railroad	Construction Equipment	Pumps & Valves	Truck	Other	Corrosion Resistant	Carbon & Low Alloy	Heat Resistant	Other	
Ohio (Continued)														
Crucible Steel	J	1	8,500	2,000		2,000	2,000		2,500	X	X			Not Available
Dayton-Walther	C	1	22,000					22,000			X			40
Durion	25J-75C	1	4,800				4,800			X				220
Fisher Cast Steel Products	J	1	1,200				1,200			X		X		120
Larson Consolidated	J	1	4,200						4,200		X			50
Marion Power Shovel (Dresser)	25J-75C	1	7,000			7,000					X			60
Massillon Steel Castings	J	1	7,500	2,000		2,000	1,000	1,000	1,000		X	X		80
Midland Ross	J	1	14,000	2,000	10,000		1,000		1,000		X			50
Sandusky Foundry & Machine	J	1	18,000	2,000			3,000		13,000	X	X	X	X Man-Aus.	Not Available
Sawbrook Steel	J	1	7,000	1,000			1,000	1,000	4,000		X			70
Teledyne Ohiocast	J	1	3,600				2,000		1,600	X	X	X		70
Pennsylvania														
Bethlehem Steel	C	2	25,000						25,000	X	X	X	X Man-Aus.	55
Birdsboro Corp.	J	1	30,000		5,000		3,000		22,000	X	X	X		70
Dodge Foundry & Machine	J	1	7,500				7,500			X	X			75
Duralay Brew-Knox	J	1	7,000				4,000		3,000	X		X		120
Elwood Steel Castings	J	1	4,800						4,800		X	X		Not Available
Empire Steel	J	1	6,000				3,000		3,000	X	X	X		130
Frog Switch	J	1	25,000		20,000				5,000				X Man-Aus.	90
General Alloy	J	1	5,000						5,000	X	X			Not Available
Gayne Pump (Goulds)	C	1	1,600				1,600			X				Not Available
Keppers-Sprout Waldron	C	1	2,000						2,000	X	X	X		100
Latrobe Foundry	J	1	2,500						2,500		X			40
Lebanon Steel	J	1	9,600				7,600		2,000	X	X			150
Mackintosh-Hemphill (G&W)	90J-10C	1	25,000						25,000		X			60
McCaffery & Turley	J	2	55,000		44,000	8,000			[illegible]		X			25
National Castings (Mid-Ross)	J	1	55,000	6,000	49,000						X			30
Oil Well Div. (U.S. Steel)	75J-25C	1	4,800								X			60
Pennsylvania Steel	J	1	4,800			800	2,000	1,000	[illegible]	X	X	X		140
Quaker Alloy	J	1	7,200				6,000		1,20[illegible]	X	X	X		150
Union Specialty Steel	J	1	8,400	7,000					1,40[illegible]		X		X Man-Aus.	Not Available
Wean United	50J-50C	1	42,000						42,000		X			80

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DEPARTMENT OF EXTERNAL AFFAIRS
OTTAWA, CANADA

MAJOR COMPETITIVE U.S. STEEL FOUNDRIES
(Six-State Region)

Foundry	Captive Or Jobbing	Number of Plants	Capacity Annual Net Good Tons	Major Markets Served						Alloys Produced				Productivity Level Man-Hours/Ton
				Mining	Railroad	Construction Equipment	Pumps & Valves	Truck	Other	Corrosion Resistant	Carbon & Low Alloy	Heat Resistant	Other	
Wisconsin														
Amsoco Foundry, Inc.	J	1	7,000						7,000		X			Not Available
Bucyrus-Erie Co.	C	1	40,000	10,000	2,000	20,000			8,000		X			35 to 45
Falk Corp. (Sundstrand)	SOJ-50C	1	26,000	5,000	1,000	5,000			13,000		X			45
Cortland Foundries Inc.	J	1	2,000	500			500		1,000	X		X	X Man-Aus.	150
Grede Foundries Inc.	J	1	16,000	3,000	2,000	6,000	2,000		1,000		X			40 to 50
Harris Metals Inc.	J	1	3,000						3,000			X	X Man	Not Available
Crucible Steel (Hewmet)	J	1	24,000	3,000		10,000	2,000		9,000	X	X	X		Not Available
Jones, Inc.	J	1	3,500	1,000		1,000			1,500		X	X	X Man-Aus.	Not Available
Maynard Steel	J	1	20,000		2,000	8,000	2,000	2,000	6,000	X	X		X Man-Aus.	40
Evinrude Motors	C	1	8,000						8,000	X	X			Not Available
Pelton Casteel, Inc.	J	1	15,000			4,000	3,000	1,000	7,000		X			40
Racine Steel	J	1	35,000		1,000	6,000	3,000	20,000	5,000		X		X Man	60
Reward	SOJ-40C	1	7,000	2,000		2,000			3,000		X		X Man-Aus.	Not Available
Stainless Foundry & Eng. Inc.	J	1	2,000				1,000		1,000	X				220
Waukesha	J	1	2,000						2,000	X		X		150
Wohr Steel	J	1	25,000	10,000		10,000			5,000		X			45
Wisconsin Centrifugal	J	1	15,000				5,000		10,000	X		X		200

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